

THE MEDICAL CLINICS OF NORTH AMERICA

Volume 11

Number 2

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FURTHER CLINICAL STUDIES IN ESSENTIAL ARTERIAL HYPERTENSION

SOME of the present-day notions concerning the etiology of arterial hypertension go back to the once prevalent idea that high blood-pressure resulted from a call on the part of nature for a rise in blood-pressure to enable more blood to be driven through crippled kidneys in a given time, so that in this way a failing urinary output might be averted. In a word, that arterial hypertension was therefore to be considered as compensatory and conservative. Later on, however, a group of cases was described by Sir Clifford Allbutt in which arterial hypertension was found, but in which no lesions were discoverable in either heart, arteries, or kidneys, and to this group Allbutt gave the name of hyperpiesis. Certainly in this class of cases arterial hypertension could not play any such rôle as had been assumed for it in the group with a renal basis, for it could not, in these cases of hyperpiesis, be considered compensatory or conservative, there being no abnormal condition discoverable in the kidneys calling for either compensation or conservation. In this way, too, much doubt was further cast on high blood-pressure being always compensatory and conservative even in renal disease.

Moreover, H. C. Anderson¹ found "that destruction of 70 per cent. of renal tissue in the rabbit was not accompanied by arterial hypertension, even when prolonged renal insufficiency

resulted. By inference, then, the atrophy of renal tissue in chronic glomerulonephritis in the human is not the cause of the accompanying arterial hypertension."

It became necessary, therefore, to search for a more satisfactory explanation of arterial hypertension, and the one that appears to furnish the most plausible working hypothesis today is largely based on Marey's² law, which is: "Whatever increases or diminishes the resistance offered to the blood in passing from the arteries to the veins will cause the velocity and the arterial pressure to vary in an adverse sense as regards each other." The greater, therefore, the peripheral resistance, other conditions being equal, the less will be the velocity of the blood-stream, but the higher the blood-pressure, and vice versa.

This law then suggested the possibility of the presence in the human system of some bodies or agencies that determined through the vasomotor system of nerves a vasoconstriction of the arterial tree, resulting in increased peripheral resistance, and thereby increase in blood-pressure or arterial hypertension, assuming, of course, that the heart continued to act with a normal force. Such bodies or agencies acting in this way on the caliber of the arteries were termed "pressor bodies" or "agencies". It has been further noted by a number of observers that where, in these cases of hyperpiesis (having at the outset a normal cardiovascular system), the arterial hypertension had persisted any length of time, myocarditis developed, also arteriosclerosis, and finally chronic sclerotic nephritis, all of which lesions resulted from the strain on the heart and arteries in having to keep up a pressure many times exceeding the normal arterial pressure.

Several prominent authorities express much the same views, as follows:

Wiggers³ says: "If in an artificial circulation machine the peripheral resistance be increased, both systolic and diastolic pressures progressively increase."

Clifford Allbutt⁴ states "that high pressure and friction are competent to set up arteriosclerosis was clearly shown by Roy and Adami,⁵ and I have adduced familiar proof of it, as in the alteration of the arterial wall at critical points, as at bif-

urcations, at narrows, normal or morbid, and again at dilations with changes of wave leading to distention and elongation"; and again: "Vessels which are incessantly subjected to hydrostatic stresses cannot but betray their effects, etc., but by arteriosclerosis of high pressure, properly so-called, we mean surely lesions primarily and mainly thus produced in vessels previously sound."

Moschkowitz⁶ says: "Many facts tend to show that hypertension should be considered perhaps the most important factor in the production of arteriosclerosis. It seems that here, too, the renal lesions may be the results rather than the causes of hypertension, or, rather, the results of the same disorder causing the hypertension."

H. A. Christian⁷ states: "If hypertension persists, sooner or later one is able to demonstrate that changes will occur in the larger vessels, arteriosclerosis; that the heart will hypertrophy and heart-failure ensue, myocarditis; that renal insufficiency will appear, chronic nephritis."

As to sclerotic nephritis resulting from general arteriosclerosis Piersol⁸ says: "Since just as arteriosclerotic changes frequently follow in the wake of persistent hypertension, so inevitably in the course of this disturbance (hypertension) secondary changes occur in the kidneys."

Among the so-called pressor agencies the following may be mentioned:

1. **The Wear and Tear of Life.**—It is the high tension at which many of this age are living that brings about the high blood-pressure, directly through the strain on the general nervous system, resulting ultimately in stimulation of the vasoconstricting set of vasomotor nerves.

2. **Focal infections** are found associated in a goodly number of cases of arterial hypertension, the foci being found either in tonsils, nasal sinuses, teeth, appendix, gall-bladder, or genito-urinary tract.

3. **The intoxications**, including auto-intoxications and those of the industries, as lead, mercury, zinc, also tobacco, coffee, tea, and alcohol.

4. **Metabolic and endocrinal disturbances**, as found in obesity, gout, diabetes mellitus, etc.

Plummer⁹ has noted the incidence of arterial hypertension in hyperthyroidism; and Riesman¹⁰ and Hopkins¹¹ have pointed out a quite definite relation of hypertension to the menopause.

Very recently Major¹² has found, experimentally, that methyl guanidin is a most powerful pressor substance, and feels that increased production or deficient excretion of such a powerful vasoconstricting substance would probably produce an elevation of blood-pressure.

5. **Heredity**.—O'Hare, Walker, and Vickers,¹³ from a study of the family histories in a large group of hypertensives, feel that heredity must be considered as an important etiologic factor and also that about 40 per cent. of the members of "vascular" families show as early as the second decade signs of oncoming arterial hypertension at a later period, in symptoms indicating vasomotor weakness, nervous temperament, etc., against 23 per cent. in a control series.

They state further that these latter findings call for the protection of these younger members of "vascular" families against the stress and strains which produce hypertension. This is another appreciation of the prime importance of the early removal of pressor agencies, and especially in those predisposed through heredity.

Thus we see that, on the working hypothesis heretofore stated, arterial hypertension is developed through pathologic agencies increasing the peripheral resistance through causing a vasoconstriction of the arterial tree, and not, therefore, in its earlier stages at least, to be construed as in any way compensatory or conservative.

But it is further claimed by those who consider high blood-pressure as compensatory and conservative that it is, therefore, not indicated to make efforts at its reduction just because this condition has been discovered; for such indiscriminate lowering of blood-pressure they feel might lead to unfavorable, even serious, results.

We hope to be able to show, however, through sufficient clinical data that where it is possible to remove the sources of hypertension while the arteries still retain their elasticity or vasomotor response, high blood-pressure can be reduced without the slightest disturbance of the cardiovascular-renal function, but, on the contrary, with either conservation or improvement, or even actual restoration of this function when lost, and that, in fact, to reduce high blood-pressure under these conditions is actually conservative, while not to do so becomes sooner or later not only not conservative, but actually destructive to heart arteries and kidneys.

To appreciate this last statement more thoroughly let us consider briefly the course of essential arterial hypertension uncontrolled. Originating in subjects with a normal cardiovascular-renal system sooner or later as a result of the prolonged strain of the hypertension on the vascular coats, arteriosclerosis progressively develops, followed in many cases by calcareous degeneration in the arterial walls so that eventually the arterial tree becomes a rigid set of tubes at a narrowed caliber, no longer capable of vasodilation. In a word, a state of irreducible hypertension ensues. Suddenly during this stage of the disease the brittle cerebral vessels may give away, resulting in fatal cerebral hemorrhage, or in the meantime, chronic myocarditis, heart-failure, and death may occur as a result of the long-continued overwork of this organ, and due also to its being deprived, through the arteriosclerotic process, of the great assistance to the circulation of the elastic recoil of the arterial tree in diastole, when according to Howell¹⁴ almost as much blood is forced into the capillaries as during the systole. Or sudden fatal angina pectoris from coronary sclerosis, or coronary thrombosis, or sclerotic nephritis and uremia may close the scene. Such then is the course of so-called "benign" arterial hypertension. True, there are a few individuals fortunately endowed by nature with a cardiovascular apparatus so resistant as to withstand for a longer time the devastating strain of high blood-pressure, but in the meantime the majority succumb, and can it ever be rational to sacrifice the many for the few exceptions?

The only sense, then, in which arterial hypertension could possibly be construed as compensatory is in the neglected long-standing groups classified as irreducible compensated and decompensated, for here the hypertension cannot be lowered through vasodilation so the heart must maintain the high pressure as long as it is capable of doing so; but even in these groups high blood-pressure can never be considered as conservative, for, as we have seen, it is always finally destructive to heart arteries or kidneys. And, moreover, the fact that it can be reduced through removal of vasoconstricting agencies in the reducible compensated and decompensated groups with conservation in the former of the cardiovascular-renal system, and in the latter with improvement in the cardiac and renal decompensation or even restoration of compensation, definitely speaks for arterial hypertension being never compensatory in these two groups, but always pathologic.

High blood-pressure is never required in these groups, for if through the removal of the vasoconstricting influences the hypertension is reduced the circulation is perfectly well maintained, while damage to the cardiovascular-renal system is prevented. Why, therefore, stand idly by, permitting a case of essential arterial hypertension with a normal cardiovascular-renal apparatus to ultimately end in disaster, simply because of the fanciful dire results stated to occur from sane efforts made to control the blood-pressure? Statements too that have been made without any proof adduced to maintain them; for we cannot recall any group of cases ever presented to substantiate the horrible tragedies claimed as resulting from lowering of blood-pressure in this class of cases. On the contrary, we are convinced from a careful clinical study of some two hundred and sixty odd subjects that blood-pressure can be lowered in such cases without the slightest resulting harm, but, on the contrary, with great benefit and relief.

However, before approaching our clinical study we desire to indicate a classification we have evolved and followed in our work.

The cases have first been divided into the reducible and ir-

reducible groups, and then each of the groups is further divided into the compensated and decompensated classes.

The reducible group comprises those cases whose arterial tree still retains its elasticity or vasomotor response, so that on the removal of the agencies resulting in vasoconstriction the pressure will fall with the dilation of the arteries. While in the irreducible group the arteries no longer retain their elasticity or vasomotor response, and being therefore a fixed set of tubes at a narrowed caliber, fall of blood-pressure by vasodilation is no longer possible, giving us irreducible hypertension.

In a smaller class of cases, however, blood-pressure may be irreducible, even with the arterial tree still retaining its vasomotor response, and then the persistence of the hypertension is probably due to the impossibility of removal of the vasoconstricting or pressor agencies. This gives us, therefore, the following classification into four groups:

I. A.—Reducible compensated group.

I. B.—Reducible decompensated group.

II. A.—Irreducible compensated group.

II. B.—Irreducible decompensated group.

With the above classification in mind we present the results we have observed as shown in Charts I and II.

Chart I includes the total number of cases studied in our first and second papers, together with the 158 cases which we now report in this, our third paper, making the total number of cases reported to date 267. Taking the different groups in the order of our classification we see that in:

I. A. The reducible compensated. We have a total of 98 cases with a total average reduction in systolic pressure of 48 mm. and diastolic of 20 mm. without the slightest disturbance of either cardiac or renal compensation.

I. B. The reducible decompensated. A total of 105 cases with a total average reduction in pressure of 50 mm. systolic and 24 mm. diastolic with no increase in either cardiac or renal decompensation, but with marked decrease in the signs of decompensation in the majority, and in some of the cases a definite restoration of compensation.

CHART I
GIVING GENERAL SUMMARY OF ALL CASES STUDIED IN OUR THREE PAPERS

	Number of cases.	Sex. M. F.	Race. W. C.	Average age.	Average blood-pressure.			Results.					
					Entrance.	Discharge.	Average change.	Compensation improved or remaining undisturbed.	Unimproved.	Progressive decompensation.	Died.	Average days observed.	
I. A. Reducible Compensated:													
1. First Paper.....	12	8	4	9	53	195/106	151/88	-44/18	12	0	0	0	72
2. Second Paper.....	25	..	..	..	..	205/115	148/85	-57/30	25	0	0	0	—
3. Present Paper.....	61	24	37	58	56	197/104	151/88	-46/16	59	One not stated	0	1	21
Totals.....	98					198/107	150/87	-48/20	96	..	0	1	30
I. B. Reducible Decompensated:													
1. First Paper.....	15	5	10	12	53	199/114	151/87	-44/27	15	0	0	0	31
2. Second Paper.....	38	..	..	..	..	200/115	142/92	-58/13	38	0	0	0	—
3. Present Paper.....	52	25	27	40	50	206/117	162/94	-44/23	48	2	0	2	24
Totals.....	105					201/116	151/92	-50/24	101	2	0	2	26
II. A. Irreducible Compensated:													
1. First Paper.....	5	4	1	5	53	183/117	200/117	+20/0	5	0	0	0	30
2. Second Paper.....													
3. Present Paper.....	19	10	9	18	54	207/118	198/113	-9/5	15	2	0	2	30
Totals.....	24					201/117	199/115	-2/2	20	2	0	2	30
II. B. Irreducible Decompensated:													
1. First Paper.....	14	8	6	13	54	191/116	150/80	-41/36	0	7	0	7	39
2. Second Paper.....													
3. Present Paper.....	26	11	15	24	51	211/123	201/113	-10/10	14	5	2	5	34
Totals.....	40					204/112	183/100	-21/12	14	12	2	12	35
Total of all cases studied.....	267												

Only reducible cases presented in second paper.

Only reducible cases presented in second paper.

(Card-renal compensation normal throughout.)

II. A. The irreducible compensated. A total in the first and third papers of 24 cases with an average fall of blood-pressure of only 2 mm. systolic and diastolic 2 mm. In this group, of course, with lowering of pressure impossible through vasodilation because of loss of vasomotor response, no fall of pressure could occur as long as cardiac compensation was maintained. The 4 cases classified as unimproved refer to conditions not related to the cardiovascular-renal system. In this group the cardiac compensation must be maintained solely through the integrity of the cardiac musculature without any assistance through reduction of excessive peripheral resistance, and under such unfavorable conditions cardiac compensation cannot be long maintained in the majority of cases.

II. B. The irreducible decompensated. A total of 14 cases in our first paper with a total average reduction in systolic pressure of 41 mm., and in diastolic of 36 mm. These were cases in the later stages of cardiac decompensation where the heart had finally given away more or less completely under the terrific strain of irreducible arterial hypertension. Hence, we see none of these cases improved, with 7 unimproved; while in our third paper, with an average reduction of 10 systolic and 10 diastolic, the cases were of milder grade of cardiac decompensation as seen in the earlier stages of the disease, and here we see improvement in 14 cases and no improvement in 5. The improvement in this latter group results through temporary increased tone in cardiac musculature due to rest, cardiac tonics, etc., but this improvement can be maintained only for a short period under such unfavorable conditions.

The mortality in these four groups appears as follows:

In I. A. only one death in 98 cases, or 1 per cent.

In I. B. Only two deaths in 105 cases, or 2 per cent.

In II. A. Only two deaths in 24 cases, or 8 per cent.

In II. B. (first paper). Seven deaths in 14 cases, or 50 per cent. (more advanced cases).

In II. B. (third paper). Five deaths in 26 cases, or 20 per cent. (less advanced cases).

Here then we see graphically portrayed the disastrous re-

35	12	2	12	14	-21/12	183/100	204/112	40	207
Totals									Total of all cases studied

CHART II
SHOWING MORBID STATES ASSOCIATED WITH OUR FOUR GROUPS OF ARTERIAL HYPERTENSION IN LAST PAPER

	Number of cases.	General arterio- sclerosis, per cent.	Myo- carditis, per cent.	Nephritic basis, per cent.	Focal infection, per cent.	Lesions of central nerv- ous system, per cent.	Dia- betes, per cent.	Endo- crines, per cent.	Syphilis, per cent.	Angina pectoris, per cent.	Heart- block or fibrilla- tion, per cent.	High N.P.N., per cent.	Poly- cy- themia, per cent.	Sec- ondary anemia, per cent.
I. A.....	61	62	18	0.5	16.5	36	24	6.5	8	1.6	0	16.5	3.2	1.6
I. B.....	52	84	86	30	11.5	21	4	8	11.5	4	8	33	0	0
II. A.....	19	84	31	31	10.5	31	21	0	5	0	0	47	0	0
II. B.....	26	88	80	69	23	26	7	10	4	0	10	60	0	0
Totals.....	158	76	52	27	15	28	14	7	8	1.9	4.4	33	1.3	0.6

sults of arterial hypertension as being least marked in the earlier stages, or the reducible compensated and rapidly increasing in the irreducible groups reaching the highest point, of course, in the irreducible decompensated group. What a commentary on the "noli me tangere" policy of letting arterial hypertension run riot, and what a plea for early recognition and intelligent management of the condition.

There are also a few other interesting data presented in this chart:

First, *Sex*.—A slight predominance of the female sex, there being 109 females and 95 males. This is somewhat contrary to the older figures, but may be in accord with the modern trend of the times.

Second, *Race*.—Of course there is a preponderance of whites, largely, however, to be explained on the basis of the small proportion of beds devoted to the colored race in our hospital.

Third, *Age*.—All the cases in our three groups fall in the fifth decade, based on an average age in each group which is about the age these cases come under observation in a general hospital, but which in private practice should be considered from a prophylactic standpoint as far too late.

In Chart II we find also some points of interest as follows:

First: Incidence of arteriosclerosis is naturally least in I. A., the reducible compensated, and greatest in II. B., the irreducible decompensated, because in I. A. the arterial tree should be least damaged, while in II. B. the injury should be greatest.

Second: Myocarditis. Here we find the incidence least in I. A., where the myocardium is as yet the least involved, while the incidence rises abruptly in I. B. and II. B., the two groups where decompensation speaks for the most marked degenerative changes in the cardiac musculature.

Third: Nephritic basis column shows that in this group of 158 cases, 73 per cent. represented the incidence of essential arterial hypertension.

Fourth: Focal infection shows a general incidence of 15 per cent., which is rather lower than figures given by some other observers.

Fifth: Lesions of the central nervous system, a rather high incidence of 28 per cent. However, many of these were mostly secondary, resulting from arteriosclerosis, as cerebral hemorrhage, cerebral arteriosclerosis, etc.

Sixth: Diabetes mellitus, a general incidence of 14 per cent., which is about the usual incidence.

Seventh: Endocrines, incidence of 7 per cent., which is rather below the average, so do also the remaining morbid states present a low incidence, as syphilis, polycythemia, and secondary anemia.

Eighth: The incidence of angina pectoris appears also quite low with the higher incidence in the two reducible groups, rather suggestive of arteriosclerosis not being a most important etiologic factor; while in heart-block the greatest incidence is in the two decompensated groups, coinciding very properly with that of myocarditis.

Ninth: High N. P. N. (or the non-protein blood-nitrogen). Here we see the incidence naturally lowest in the reducible compensated group, and highest in the irreducible decompensated group; while higher in the two irreducible than in the two reducible groups.

Chart III presents the kidney function in the four groups as shown by the average percentage phenolsulphonephthalein (P. S. P.) output, and the average non-protein blood-nitrogen (N. P. N.) in mg. per 100 c.c. of blood.

Here then we have graphically depicted a definite increase in P. S. P. and also a definite decrease in the N. P. N. in the reducible compensated and decompensated groups with a definite fall of blood-pressure. So that in I. A., the reducible compensated group, the renal compensation is not in the least disturbed, but the renal function actually improved with an average fall in blood-pressure of 46 mg. systolic and 16 mg. diastolic; while in I. B., the reducible decompensated, the renal decompensation is not only not increased, but actually definitely improved, with an average fall in blood-pressure of 44 systolic and 23 diastolic, showing clearly that a lowering of blood-pressure through control of vasoconstricting agencies in the two reducible groups

CHART III

CHART SHOWING AVERAGE CHANGES BY GROUPS, IN P. S. P. AND N. P. N.,
IN THOSE CASES IN WHICH OBSERVATIONS WERE MADE AT THE BE-
GINNING AND END OF TREATMENT

	P. S. P. Average.		N. P. N. Average.	
	Per cent. output.		Mg. per 100 c.c. blood.	
	Entrance.	Discharge.	Entrance.	Discharge.
I. A.	39	44.0	48.0	37.6
I. B.	30	33.0	49.8	40.0
II. A.	29	32.0	41.4	39.2
II. B.	18	12.5	64.7	92.1

does not disturb in the least the renal compensation in the compensated group nor increase, but, on the contrary, decreases the decompensation in the decompensated group.

In II. A., the irreducible compensated group, the changes are about as we would expect; but

In II. B., the irreducible decompensated group, we have a marked decrease in the percentage P. S. P. output, and an even more marked increase in the N. P. N., due to a fall of blood-pressure, not through vasodilation due to removal of vasoconstricting agencies, but through a heart failing behind an irresistible peripheral resistance, and thus decreasing the renal function through chronic passive congestion. (In this group of cases no effort, of course, had ever been made to lower blood-pressure.)

Thus we see that the function of the kidney is no more disturbed than is that of the heart through a lowering of blood-pressure through removal of vasoconstricting influences, resulting in a vasodilation of the arterial tree. This is another point against the old idea of arterial hypertension being compensatory and conservative in the maintenance of renal function.

The cases in all four of the above groups were unselected, save that no case included was not observed long enough to af-

ford conclusive data. The average blood-pressure readings were arrived at by adding together all the systolic pressures, likewise all the diastolic pressures in each group, and dividing all such totals by the number of cases in the respective groups.

The general plan of treatment of these same groups consisted practically entirely in efforts at removal of the accompanying conditions which seemed to bear a causal relation to the arterial hypertension, all remedies of the vasodilator class being reserved mainly for complications and emergencies, such as cerebral hemorrhage, angina pectoris, and coronary thrombosis.

Based then on the study of our three groups of cases we desire hereby to record our impressions as follows:

I. Essential arterial hypertension is not primarily established to serve either a physiologic, compensatory, or conservative purpose, but results from the accumulation in the human system of certain pathologic influences or agencies which stimulate the vasoconstricting system of nerves, resulting in narrowing of the lumen of the arterial tree, thereby causing increased peripheral resistance and arterial hypertension.

II. Removal whenever possible of these pathologic influences or agencies at a time when the arterial tree still retains its elasticity or vasomotor response will result in a return toward normal blood-pressure with no disturbance, but, on the contrary, an improvement in cardiorenal function.

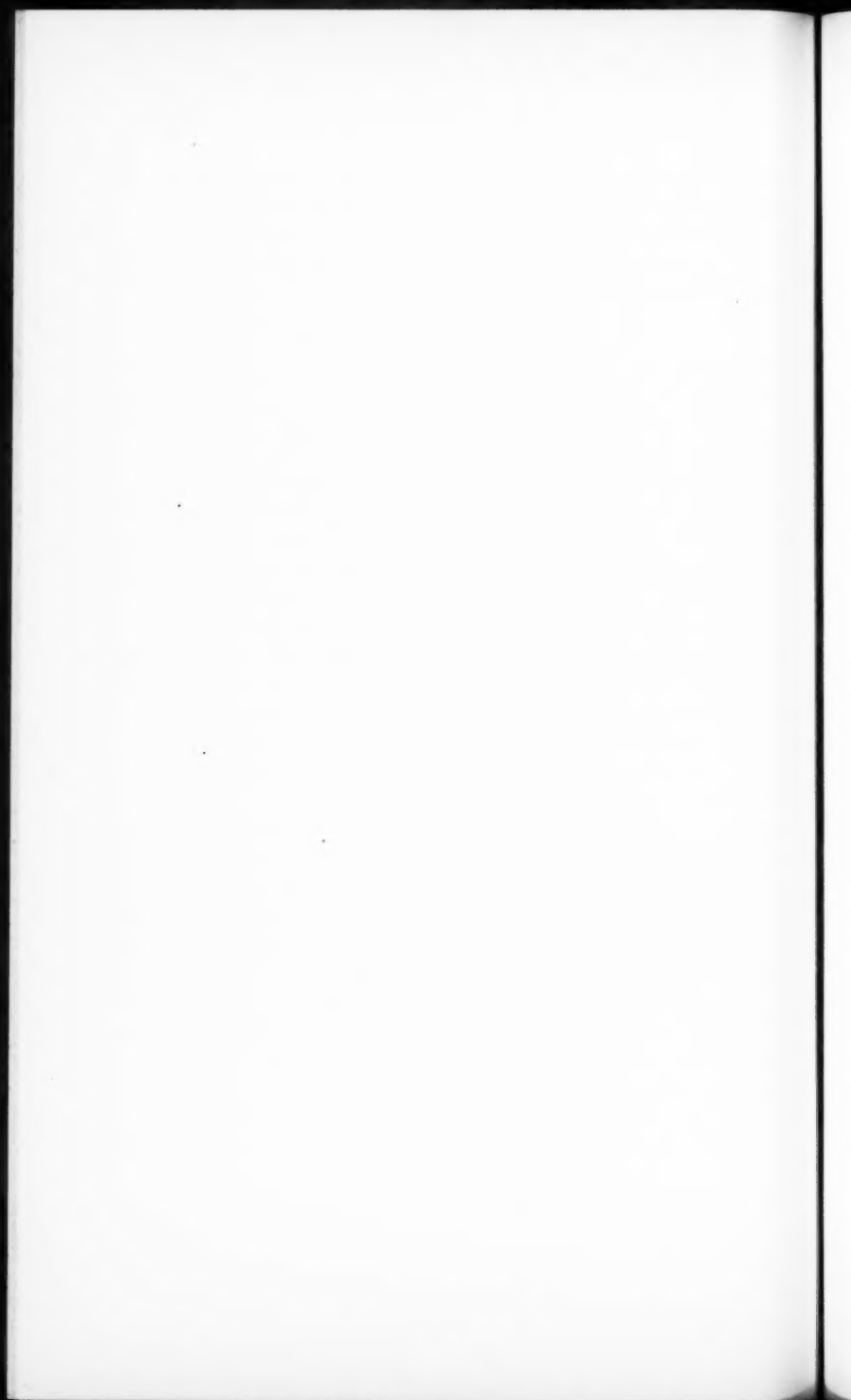
III. Uncontrolled cases of arterial hypertension finally result in fixation of the arterial tree at a narrowed caliber from irremovability of pressor agencies or due to the sclerotic or calcareous process, with loss of elasticity or vasomotor response furnishing the condition of irreducible hypertension in which the high blood-pressure can no longer be controlled through vasodilation. Here all efforts at blood-pressure reduction are practically always unavailing and nothing remains but to maintain, as best we can, the propelling force of the heart. In this sense only can arterial hypertension be considered at all compensatory. Never conservative, however, but always ultimately destructive.

IV. Essential arterial hypertension should be sought for,

therefore, at as early a period as possible, and every sane effort made to control the condition through removal of all pressor agencies, so that the cardiovascular-renal apparatus may be protected and conserved, to the end that the development of the state of irreducible hypertension be prevented.

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CLINIC OF DR. JOHN ZAHORSKY

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GIARDIASIS IN AN INFANT

BEFORE presenting the cases collected for this clinical lecture I desire once more to lay stress on the value of examining the diarrheal stool with the microscope. The cases reported here were all diagnosticated by the help of this simple technic.

Use a soft-rubber catheter, lubricated with soap or, preferably, glycerin jelly, and insert it in the rectum to the distance of 1 or 2 inches. The catheter in a few moments will be more or less filled with the liquid stool unless the rectum is empty. It will not do, even when the stool has been recently passed, to take it from the diaper, since the fluid portion of the stool has been absorbed by the cloth. It will be useless to send the stool to the laboratory, for even a delay of half an hour vitiates the results. The stool must be examined at once; hence, it is necessary to have a microscope in the examining room, or at least on the same hospital floor.

The stool obtained, if very liquid, is emptied into a small dish and its gross appearance noted. If the stool does not flow freely from the catheter, a small portion may be obtained from the eye of the catheter with a tooth-pick or applicator.

One drop of water is placed in the center of a slide and enough stool thoroughly mixed with this to make a translucent fluid. The larger masses are pushed aside on the slide.

The slide without a cover-glass is then examined under the low power of the microscope.

What do we expect to see?

We look for mucous curls, mucous plaques, crystals, ova, protozoa, and cells; especially leukocytes and macrophages.

In order to illustrate the value of this simple procedure I will show you 2 interesting cases, and relate to you the history of several others.

J. L., boy, eight months old, the first pregnancy of a healthy looking mother. The father is said to be healthy, and did not serve abroad during the World War. The infant was born at term, and was fed exclusively at the breast until five months old; then, in order to overcome a tendency to constipation, the mother gave some prune juice every day. As this did not entirely remedy the disorder, she also gave the baby some bran decoction to drink two or three times a day.

The chief complaint is that the baby is growing pale and not gaining in weight. He refuses to eat and the mother seeks advice as to the proper diet.

You see the baby looks very pale, but otherwise seems well nourished. Its weight is about 16 pounds.

The baby has no teeth, the fontanel is open, but there are no definite rachitic changes present. Physical examination of the heart and lungs reveals nothing wrong. The abdomen is somewhat distended, but the spleen is not palpable. The mouth and throat have a normal appearance, except that the mucous membrane is pale. The blood examination: Hemoglobin, 65 per cent.; red cells, 2,500,000; white cells, 9000. Differential count: Polymorphonuclears, 25 per cent.; lymphocytes, 72 per cent.; transitional, 2 per cent; no eosinophils seen, platelets numerous.

The diagnosis, then, would seem to be a secondary anemia due to faulty diet.

Stool Examination.—The stool is rather thin, but not watery; under the low power of the microscope a large number (eight to ten to each field) of oval, refractile bodies are visible.

These proved to be cysts of *giardiæ*. The trophozoite was not found at this time.

The diagnosis of giardiasis, therefore, seemed to be conclusive.

I am fully aware that several writers have denied the pathogenic influence of the *giardiæ* (*e. g.*, Boeck, Arch. Int. Med., Jan., 1927). It would be rash even in this case to assert that the

anemia was caused entirely by the infection of the alimentary canal by these flagellates. From a limited experience (I have seen only 5 cases of giardiasis in infants) I cannot but agree with Reginald Miller that this infection often produces a chronic diarrhea in young children which may result in a retardation of growth and development. In this case there has been no marked diarrhea and there is no retardation of growth, the only striking group of symptoms is the well-marked secondary anemia. It is questionable whether the giardiæ are connected with this anemia in an etiologic relationship. I will, therefore, order a diet of protein, vegetables, fruits, and cereals, diminish the maternal nursing, and prescribe a mild iron tonic.

Following the suggestion of Wenyon we have been treating our cases of giardiasis by administering bismuth salicylate in full doses several times a day. The clinical condition improved in all cases; the infants gained in weight, the diarrhea was checked, and the cysts of the giardiæ disappeared. But we have had relapses, and it is still undecided whether or not the intestinal canal can be permanently cleansed of this infection by means of this drug.

There are no diagnostic symptoms of giardiasis. A persistent looseness of the bowels in a baby should lead the physician to examine the stool microscopically. The cysts are easily seen as refractile oval bodies about the size of a polymorphonuclear leukocyte. In case of doubt we have made use of Kofoid's modification of Donaldson's iodine-eosin stain, which brings out the structure of the cysts. The nuclei, like two eyes in one end of the cysts, are very characteristic. Occasionally one is so fortunate as to encounter the trophozoite, or vegetative form, which looks like a tadpole and cannot be mistaken for anything else.

a
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INFECTION BY THE TRICHOMONAS HOMINIS

WE encountered the *Trichomonas hominis* twice in the examination of several hundred stools last summer. This flagellate is generally acknowledged to be non-pathogenic, but the possibility that it may do harm to the young infant when it is present in enormous numbers in the intestinal canal has not been positively excluded. It may be well to analyze one of our cases.

C. W., nineteen months old, has been a healthy boy since birth. He was seen on August 5, 1926. The mother stated that he had four stools during the night and several during the day. The stools were thin, undigested, with a very offensive odor. The baby had not vomited and no fever was noticed. He had been on a general diet, including commercial milk and ice-cream, also taking raw vegetables. The patient was a well-nourished baby, with no evidence of disease anywhere. The stool was thin but not watery, and greenish in color. A specimen diluted with water showed very few leukocytes, but four to six rapidly moving parasites were seen in every field. At first the movement of the flagellates was so swift that their structure could not be made out, but after a few moments the movements became slow and the undulating membrane could be plainly discerned; the flagellate was identified as the *Trichomonas hominis*.

We stained a specimen and a curious phenomenon was observed. The bacteria of the stool consisted almost entirely of large, slender bacilli, sometimes occurring in chains. This bacillus resembled the *Bacillus maximus* so often found in the mouth. The baby was treated by the withdrawal of milk from the diet and the administration of bismuth salicylate. Three days later the baby seemed better and no flagellates could be found in the stool.

From a study of this and 2 other similar cases we concluded that the trichomonas is a harmless and accidental intestinal parasite.

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INFANTILE ECLAMPSIA

A FEW days ago a female infant was brought to the hospital an eclamptic state. The baby was cyanotic, head retracted, arms pressed to the sides, lower extremities extended, eyes turned upright; a tonic and clonic spasm. Under the influence of ether inhalation the body relaxed. The baby had had ten convulsions in as many hours. The rectal temperature was 100° F.

The patient was two months old and had been artificially fed on a variety of foods since she was three weeks old. The last two weeks she had received diluted certified milk (milk $\frac{2}{3}$, water $\frac{1}{3}$, with cane-sugar added). The milk was not boiled. She seemed to thrive on this food, but had become very constipated the last two days. The baby has also had a "cold," slight coryza and cough. Suddenly at 3 A. M. she had her first convulsion. A physician was called, who gave her a soap-suds enema and prescribed some medicine. She was semiconscious two days, but had repeated convulsions.

The baby was fairly well nourished, the skin cool, the head somewhat retracted, but not rigid. The pupils were very much contracted, the fontanel depressed. The extremities showed slight rigidity. The chest gave no evidence of pneumonia, only a few coarse râles were present. The throat was congested; ear drums normal. The abdomen was slightly distended. An enema brought away very little constipated stool. No Brudzinski or Kernig, no evidence of rickets, no Chvostek. The diagnosis could not be made. The baby was placed on barley-water and sedatives prescribed. In spite of repeated inhalations of ether, chloral by rectum, and even magnesium sulphate (7 mm. of a 25 per cent. solution) hypodermically, the convulsions continued for twenty-four hours. Meanwhile the baby vomited twice, its temperature rose to 101° F., and the bowels showed a marked tendency to looseness. An examination of the stools showed evidence of a beginning enteritis. On the following day the stools

under the microscope which were thin and watery, were packed almost solidly with pus-cells, mostly polymorphonuclears and macrophages. With the appearance of this intestinal discharge the convulsions ceased, but the baby is still not well; the enteritis interferes with food absorption. I have several times emphasized that the discharge of pus-cells in the enteritis of children is a phenomenon of resistance, and toxic symptoms are often ameliorated when this discharge occurs. The diagnosis in this case was in extreme doubt until we demonstrated the presence of these cells under the microscope.

Let me emphasize this point: In all diarrheal conditions examine the stool for pus-cells. It is a mistake to ascribe a nutritional disorder to a parenteral infection without excluding enteral infection by an examination of the stool.

EXUDATIVE ENTERITIS

BEFORE presenting the next case, let me, by way of introduction, make a few remarks on the problem of maternal nursing. One of the most common experiences of the pediatrician is the difficult feeding case, nursed at the breast. Hundreds of mothers two to four weeks after parturition consult the physician on account of severe dyspeptic symptoms presented by the baby. I do not hesitate in pronouncing this the greatest problem of dietetics. The treatment is unsatisfactory to both physician and mother, and the usual result is that the baby is put on the bottle.

The dyspeptic symptoms are as follows: The baby becomes restless and has severe crying paroxysms. He does not sleep, seems unhappy, and usually acts as if he were hungry. The crying of the infant, sometimes lasting for hours, produces a nervous, starved, and exhausted condition of the mother, and the quantity of milk rapidly diminishes. The baby always shows some intestinal symptoms, such as meteorism and the passing of gas. The stools are sometimes frequent, and contain small curds and mucus. The passages are often green and watery and are ejected with a spurt. The baby ceases to gain in weight and may even lose. This indigestion of the young breast-fed infants has been described under a variety of names—flatulent colic, indigestion, acid dyspepsia, etc.

The theories of causation are very numerous. Budin reported some observations, and suggested that an excess of fat in the milk might produce this indigestion. This is corroborated by the fact that an increased amount of fat and fatty acid crystals are found in the stool. Again, these symptoms have been ascribed to an excessive carbohydrate fermentation. The presence of so much gas and the high acidity of the stool lend support to this view. The stools invariably contain much mucus, are often very irritating to the buttocks, and it is not unreasonable

to assume that the high acidity may cause a marked irritation of the intestinal mucous membrane as it does on the skin around the anus. But the principal objection to either of these theories is that an increase of fat in the stool and an excess of carbohydrate fermentation are always present when the chyle is passed too rapidly through the small intestine. These changes may be only secondary to some other irritation which makes the lining of the ileum sensitive and heightens the vermicular movements.

Considerable clinical and *x*-ray evidence has been collected to show that the intestine, and sometimes the stomach, are subject to tonic contractions in many of these cases. The normal pendular and vermicular movements are replaced at intervals by tonic contractions which cause the pain and interfere with the proper advance of the chyle. Hence has arisen the theory that the vegetative nervous system is the seat of the disorder. The primary trouble is a neurosis of the autonomic nervous centers. Like all theories pushed to the extremity of our knowledge, this can neither be proved nor refuted, but before accepting this theory we must be sure that no primary irritation of the intestinal lining is present. This has not been done.

A very popular theory at present is the hunger theory. The baby cries so much because it is hungry. The cramps in the abdomen are hunger pains. The green stools are so-called hunger stools. This is corroborated daily by the fact that when the baby is given complementary feedings the symptoms are ameliorated, and if the infant is put on the bottle entirely it thrives and is satisfied.

It is not my purpose here to enter into a full discussion of these theories at this time. I have tried to verify one and all of these theories in practice, and at some future time may report the actual testing of these theories. In regard to the hunger theory I believe we have shown that the baby in some instances is hungry, but these are not the screaming babies that drive the mother to distraction. As a rule the baby is hungry because it does not suck vigorously or long enough. It has too much pain. The milk of the mother diminishes because the baby does not empty the breast. If the breast is artificially emptied after the

baby stops nursing the lacteal secretion will be maintained in most cases. This method, so highly recommended by Sedgwick, seems too laborious for most mothers, with the result that bottle feeding becomes the rule instead of the exception.

I now will show you a case in which the microscopic picture of the stool indicates a marked lesion of the intestinal lining and it is most rational to assume that the other symptoms are secondary to this pathologic change.

F. K., boy, first-born of healthy young parents. Four weeks old. The mother was in the hospital for two weeks after parturition, and during this time the baby was given complemental feeding of buttermilk. Birth weight was $6\frac{3}{4}$ pounds. He now weighs $7\frac{1}{4}$ pounds. As soon as the mother attempted to take care of her baby by herself she encountered great difficulties. She tried to nurse the baby exclusively, but the baby did not thrive; he vomited excessively and screamed day and night. The bowels became very loose; seven to ten stools were passed daily. On the advice of her physician she lengthened the interval of feeding to four hours. She diminished the length of nursing to ten minutes. In spite of this the baby continued to have violent digestive symptoms. Then 1 ounce of barley-water was given before nursing. On the twentieth day the baby showed a diffuse erythema on the skin which persisted for several days. Vomiting and diarrhea continued. The baby is thin, muscles flabby, and seems restless and unhappy. You will notice a marked erythema on the face. The abdomen is distended and somewhat tense. There is marked irritation of the skin around the anus. He has gained only $\frac{1}{2}$ pound since birth.

We will introduce a catheter in the rectum and obtain some stool. You notice the stool is very watery, greenish in color, but contains shreds of mucous curls, granular and cellular plaques, and numerous free cells, mostly lymphocytes. I must explain these terms.

The term "mucous curl" in our laboratory is applied to thick yellow bodies generally curled in a semilunar or annular shape, sometimes S-shaped, at other times spiral, intensely yellow in color. They are only rarely found in the stool of artificially fed

babies. They are very significant of an acid irritation of the bowels, presumably in the small intestine. These curls are often studded with fat globules and often with fatty acid crystals. In some cases numerous lymphocytes and epithelial cells are found attached to the curls.

The second name used is the "mucous plaque". These are not stained with bile and are translucent. They are not curled into balls and crescents, but lie broad, thin, and flat under the microscope. These plaques are assumed to be mucus secreted by the colon, sigmoid, or rectum. In this case you will notice that many of them are thickly studded with cells. The cells lie close together, and on staining prove to be columnar epithelial cells, somewhat distorted. A desquamation, therefore, is going on in the intestine. Sometimes we find these plaques peppered with lymphocytes. This specimen contains a few of these. Finally, I wish to lay stress on the third finding. The fluid surrounding the curls and plaques contains numerous small cells, 10 to 20 in each field. The cells are quite different from the cells of the infectious enteritis. In that type of enteritis polymorphonuclear cells and macrophages predominate. In this case the lymphocytes are in abundance.

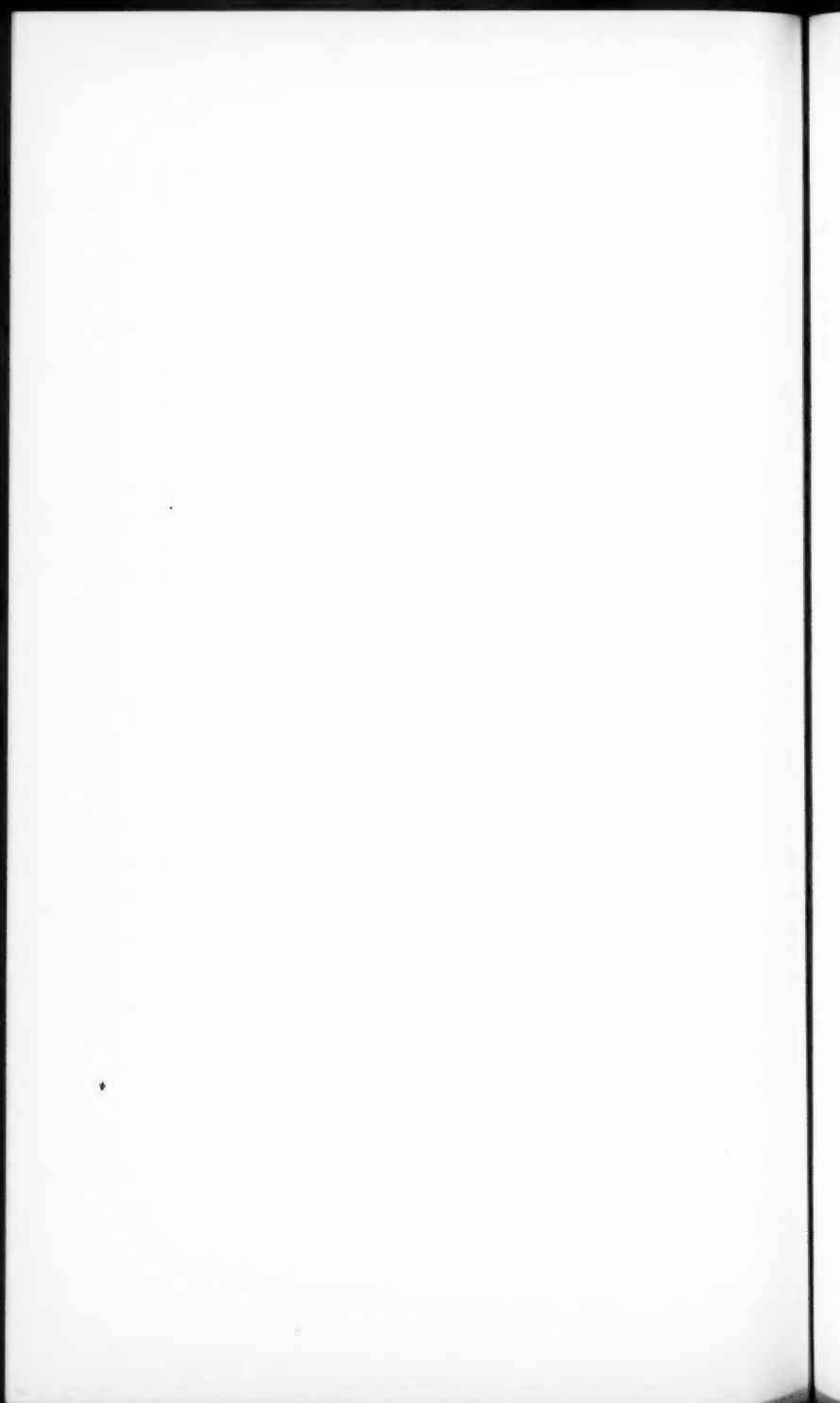
I apply the term "exudative enteritis" to this condition in young babies. Czerny applied the name "exudative diathesis" to a syndrome the principal symptoms of which are digestive disturbances, malnutrition, and irregular erythematous eruptions which may terminate in a protracted eczema.

Changing the food in these cases promptly changes the character of the stool and the general condition becomes much better. The disease will, however, gradually improve even when the baby is kept on the breast, but it takes much time and not many mothers have the hardihood to stand the strain. I consider this exudative enteritis as one of the principal causes of bottle feeding. The babies have so much pain they will not empty the breast, and the maternal milk rapidly diminishes.

As to the nature of this disorder, nothing is definitely known. It is customary now to speak of such reactions as allergic, and the name "allergic enteritis" has found its way into medical litera-

ture. It is premature, however, to identify this disease in young infants with the known allergic disturbances of children and adults.

Are all nutritional disturbances in young infants even when unaccompanied by rashes similar in nature? I venture the opinion that they are similar except in those cases where underfeeding or overfeeding are clearly manifest. The secondary symptoms, such as flatulency, colic, meteorism, enterospasm, acid, and mucous stool, result from the irritative lesion of the intestine and the resulting interference with peristalsis and absorption.



CLINIC OF DR. ANDREW B. JONES

WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

A FAMILY OF FAMILIAL CLAW-FOOT

A CLINIC devoted to a presentation of the problem of inherited or familial disease of the nervous system suggests two phases of this question that at first sight seem somewhat disconnected. The one has to do with the recognition of the clinical picture, the other with the wisest method of handling the patients who are so afflicted. Cure in the ordinary sense cannot be hoped for in these conditions. Early recognition, however, gives an opportunity to prepare and plan for the future so that the best possible conditions can be provided and useless expenditure of money and illogical methods of cure be prevented. It is therefore important that the usual familial and hereditary types of motor involvement be known so that they may not be confused with other types in which the prognosis is not so hopeless and in which therapy can accomplish some result. In most instances in which these cases occur, many years go by before it is realized that the condition is necessarily incurable, and much effort is wasted which might better be utilized in some form of education or training through which the individual can at least be given the opportunity of living a more useful and sometimes a happier life. In conditions of the sort that this clinic treats, the sooner the patient realizes that his condition cannot be handled by the usual medical methods, the better adaptation to his handicap can be made and the better will his attitude become to such constructive methods aimed to lighten this handicap. These cases of the neural type of progressive muscular atrophy are to be shown because they illustrate the familial characteristic of this disease and present for consideration some of the problems that have been mentioned.

The neural form of progressive muscular atrophy is usually described as beginning in the second half of childhood or even in the third or fourth decade. It is always familial. It may be transmitted to the children usually through the father or miss a generation. Men are more often affected than women. The development is insidious, beginning in the great majority of the cases in the small muscles of the foot, in the peronei and common extensors of the toes, accompanied by development of club-foot or equinovarus, and usually with the claw position of the toes. The calf muscles are atrophied later. After some years the upper extremities become involved. The small muscles of the hands, the thenar and hypothenar eminences and interossei being first and most affected. A claw-hand is thus developed. Fibrillary tremors are observed. There is partial reaction of degeneration. The knee-jerks are usually absent. Sensory disturbances may or may not occur. The disease runs a very slow course and there may be long periods of remission or arrest in the progress of the disease. There is not necessarily any pronounced limitation of the movements of the extremities in spite of the atrophies. The patient may live to old age and lead a rather active life.

Pathologic Anatomy.—Degeneration of the posterior columns, lateral columns, and atrophy of the anterior horn cells, anterior roots, and the peripheral nerves.

PRESENTATION OF CASES

Case I.—Mrs. L. L., age thirty-eight, married, housewife. Mother healthy during gestation; normal labor. The oldest of two children. The second, born eighteen months later, died at eighteen months of age of some wasting disease said to be tuberculosis. Healthy child until the age of seven, when her toes and feet began to turn in, with a weakness of the knees. The feet and legs did not seem to get smaller, but "did not develop." At fourteen or fifteen the hands became weak and wasted, the fingers were drawn so that she was unable to use them for many months. Following prolonged re-education and passive movements the fingers and hand completely recovered. She learned to play the piano.

Marital History.—Married at eighteen and a half years. Husband living and well, native of Austria-Hungary. No notable illnesses. Physical and neurologic examinations are entirely negative.

Children.—John, age nineteen, full term, forceps delivery. Breast fed; walked at eleven months of age. Congenital hypopspadia. At the age of seven his feet began to turn in and he had difficulty in walking, complained of weakness of his legs, soon followed by formation of claw-toes and atrophy of the legs



Fig. 27.—Case I. Note foot deformity; position of toes.

to the knee. At the age of fifteen the family noted that his hands were "thin and drawn." This progressed until he was unable to write. Diagnosed Charcot-Marie-Tooth disease in this clinic during 1915-1916. For the past two years he has been in a sanatorium for tuberculosis where he recovered the use of his hands; writes letters home, etc.

J. M.—Died at age of ten months. Some gastro-intestinal disease.

J.—Age sixteen. Case II.

A.—Age fourteen. Case III.

L.—Age twelve. Case IV.



Fig. 28.—Case I. Note cylinder legs and smallness of lower part of thigh.

M. G., age eight. Healthy, robust school girl whom the parents consider perfectly normal. She has brown hair and eyes and does not resemble any member of the family. Examination: Walks with steppage gait and slight tendency to invert feet. Reflexes normal; no apparent atrophies, weakness, or fibrillary twitchings.

Lola.—Died at eighteen days. Cause unknown.

Family History.—Mother died at age of fifty-eight of consumption(?). Perfectly well until fifty-five. Father died at age of twenty-six of consumption. All of his people are said to have died at an early age of consumption. During his lifetime he complained of "weak knees." Mrs. L. L. knows of three first cousins, children of a sister of her father's, who have weak knees. She denies any family disease in her mother's family. They lived to be seventy or more years of age.

Physical Examination.—Rather stouter than the average person. Dark brown hair and eyes, large face, loose, sagging, expressionless cheeks, large shoulders, well-developed arms and forearms, no atrophy or deformities of the hands, rather small wrists and lower third of forearms. The grips are very weak. There is no limitation of movements of the spine. The hips appear in no way to be abnormal. There is a sharp tapering of the thighs beginning at the upper portion of the lower third and extending downward to the knee. No limitation of movements at the knee. No apparent weakness of the muscles of the thighs. The legs are relatively small, and all the muscles have a doughy feel. Equinovarus of the foot and marked pes cavus. Claw position of toes. She cannot move her feet or toes in any direction. Passively they can be moved in all directions. The knee-kicks and ankle-jerks are absent. No response to plantar stimuli. Arm reflexes absent. Sensation superficial and deep intact. (Deep sensation, toe position, vibration sense, and the like were examined.) The legs and feet have a slightly cyanotic color and are quite cold to the touch. The dorsalis pedis is not palpable. *x-Ray* examination of the legs and feet show no bone pathology other than what is called a paralytic lack of development. The muscles of the legs and feet do not respond to faradism or galvanism.

Case II.—J., age sixteen. Normal birth, breast fed, slightly under weight as a child. "Nothing wrong" noted until about the age of eleven, when he began to have difficulty in running. Could not walk on his heels or toes. The feet turned in and sometimes

he would fall. Examination in O. P. D., November 10, 1922, as follows: Poorly developed muscles of legs. Walks on outside of foot. Marked pes cavus. Claw position of toes. Weakness of all muscles of the legs. K. K. very sluggish, slight lordosis, and



Fig. 29.—Case II. Note left foot; position of hands.

pot belly. In the interim has continued school, where he learned readily. At present is working in a restaurant as a waiter.

Physical Examination.—Well developed and nourished boy. Walks with a steppage waddling gait. Fibrillary twitching of many muscles, especially legs and forearms. Talipes equino-

varus, left, bilateral pes cavus, and claw position of toes. Some shortening of left tendo achillis. Grips are very strong (within the last month the hands tire easily). The cranial nerves are intact. The arm reflexes present, equal and active. The K. K.



Fig. 30.—Case II. Note deformity of feet.

are active. The A. J. and plantars are absent. No response of muscles of legs, feet, and opponens pollicis to faradism or galvanism; the other muscles respond readily to both.

Case III.—A., age fourteen. Normal birth and childhood until the age of two and a half years, when he developed a cough which was diagnosed consumption, and family advised to go to New Mexico, where they remained for some four years. Boy apparently recovered and appeared to be perfectly well until within the last two months he has complained that he

cannot run or walk on his tip toes, and that his feet go over on the outside and the large toes are drawing up.

Examination.—Very slender, but proportionately built boy. Sharp face, black hair and eyes, resembling his father. The pupils are equal, regular, and react. E. O. M. are normal. Eye-grounds, slight pallor of the temporal side of the discs. The biceps, triceps, radial, abdominals, cremasters, and K. K. are present, equal, and active. Right ankle-jerk is absent, left



Fig. 31.—Case III. Note: Symptoms for two months; well-shaped legs, only toe deformity.

equivocal, plantars are flexor in type. Sensation superficial and deep intact. Shoulder-girdle intact. Strength of arms and fore-arms consistent with muscular development. The grips are surprisingly weak. Some atrophy of the thenar eminences with a beginning manus cavus. No limitation of movements of the back, hips, shoulders, elbows, wrists, or knee-joints. No loss of tone or weakness of the thigh muscles. The calves are very flabby, the right more than the left, with beginning "cylinder legs." Bilateral foot-drop and slight equinovarus and pes cavus.

The great toes are extended at the proximal joints and flexed at the distal. Fibrillary twitching of the muscles of the legs, thighs, forearms, and hands. The muscles of the legs and feet do not respond to faradism or galvanism. There is a reduction of



Fig. 32.—Case III. Note toe deformity and beginning pes cavus.

electrical excitability in the opponens pollicis and quadriceps extensor—requires one and a half times stronger current to elicit response than the unaffected muscles.

Case IV.—L., male, age twelve, Barnes Hospital baby. Quite healthy until the age of seven, when his toes began turning in, soon followed by thin legs. One year ago he had some sort of infection of the left knee-joint called blood poisoning, from which he readily recovered. Boy has very large head and face, brown hair and eyes, resembling his mother. The shoulders and hips are well developed. Second degree lordosis. Slightly prominent abdomen. Genitalia are small, but well formed. The muscles of the arms and forearms are small, but strong. Grips are very poor. Some atrophy of the hyperthenar eminences. Muscles of back and thighs are quite strong. The legs are almost cylindrical, being practically the same size from knee to ankle. More marked equinovarus, pes cavus, and claw position of the toes than in the

other cases. Partial fixation of the left ankle-joint. Shortening of tendo achillis. Gait, slightly steppage waddling. Neurologic examination: Pupils are equal, regular, and react to L. A. and C. E. O. M. normal. Eye-grounds, disc outline clear. The outer three-fourths of the nerve heads are grayish white. The blood-vessels do not appear to be unusual. Visual acuity O. D. 20/75. O. S. 20/60. No weakness of the face or tongue. The biceps, triceps, and radials are obtained with much difficulty, if at all.



Fig. 33.—Case IV. Note position of toes and marked pes cavus.

Knee-jerks are active. Ankle-jerks absent. No plantar response. Abdominals, present and equal. Sensation superficial and deep intact. The legs and feet are slightly cyanotic and extremely cold. Dorsalis pedis palpable. No response to faradism or galvanism of the muscles of the legs and feet. Small muscles of hands respond readily.

Discussion of Cases Presented.—*A Summary of the Symptoms.*—Turning in of the feet, difficulty in walking, a weakness

of the legs, atrophy of the small muscles of the foot with equinovarus, pes cavus, and claw position of the toes, deformity, atrophy of the muscles of the legs, first of the peronei and the tibialis anticus (foot-drop), later those of the calf, beginning at the age of about seven or eight years; weakness and atrophy of the small muscles of the hand commencing many years later, about the



Fig. 34.—Case IV. Note position of left foot; cylinder legs.

age of fourteen, causing complete disability in Case I and in the oldest child, recovery within a period of three or four years to such a degree that Case I does not notice any disability whatever and the latter can write. There is weakness of the grips and a peculiar position of the fingers in lacing and unlacing of shoes.

The reflexes are absent in Case I and in Case IV except the knee-jerks. All present in Case III except ankle-jerks and plan-

tars. This case has shown symptoms for only the past two or three months. Absent A. J's and plantars in Case II.

Relative integrity of the proximal groups of muscles and no involvement of the trunk and shoulders.

Fibrillary twitchings in Cases II and III.

Vasomotor disturbances in the affected extremities.

Sensation intact.

Electrical excitability lost or diminished in the wasting muscle.

Contractures of the tendo achillis in Cases II and IV.

These findings are in keeping with the observation of Charcot and Marie as well as those in Tooth's thesis. Tooth stated that fibrillary twitching is not always present. In Charcot and Marie's 5 cases the triceps-jerks were present in 3 cases, absent in 1, and doubtful in the other. No mention is made of the ankle-jerks. Knee-jerks were absent in 2, present in 2, but difficult to obtain, and in the other one knee-jerk was feeble, the other absent.

The progress of the disease in this family is comparable to that of three generations of a family reported by Symonds and Shaw (Brain, 1916, 49, 387) that they consider "forme fruste" of the Charcot-Marie-Tooth disease.

DIFFERENTIAL DIAGNOSIS

Spinal progressive muscular atrophy (Aran-Duchenne) is a disease beginning in middle life, is rarely familial or hereditary. (There is a familial or hereditary form reported by Werding and especially studied by Hoffman. It occurs in the second half of the first year of life, with weakness and atrophy of the thigh, pelvis, and back muscles, later extending to the upper extremities. Symmetrical distribution, death occurring in from one to six years.) Nothing is known of the cause of the disease. The symptoms begin insidiously. Months and years may elapse before marked symptoms develop. The small muscles of the hands, opponens pollicis, and the first interossei are first involved. This soon leads to a dropping out of movements and the claw position of the hands. The atrophy is accompanied by fibrillary twitching. This may also be present in muscles that

are not visibly wasted. Paralysis is complete only in completely atrophic muscles. The atrophy develops slowly, and does not extend to the neighboring muscles, but jumps to the muscles of the shoulder-girdle, especially the deltoid. After several years the atrophy and paralysis will have developed over the arm, shoulder, and even the back muscles. The arms hang limply by the chest, but some of the muscles always retain a certain amount of power. In some cases the shoulder and back muscles are affected first. The lower extremities do not share in the atrophy, or only very late. This disease may show remissions or long periods of arrest.

Pathology.—There is always present a lesion of anterior horn cells with a resultant atrophy of the anterior roots, and motor nerves, and the muscles supplied by them.

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DYSTROPHIA MUSCULORUM PROGRESSIVA

UNDER the title of dystrophia musculorum progressiva Erb comprehended the forms of hitherto separate types of primary myopathy. These he pointed out to be only varieties of a clinical and pathologic unity. This is now generally conceded by all who have studied the disease. The primary myopathies are distinguished from the progressive spinal muscular atrophies by: First, the onset of the disease at an early age; second, the hereditary or familial occurrence in most cases; third, commencement of the dystrophia in the muscles of the trunk and the adjacent parts of the limbs, usually in the pelvic girdle and the muscles of the lumbar vertebral column, or of the shoulder-girdle and upper arm; fourth, the combination of atrophy with true hypertrophy and pseudohypertrophy; fifth, the absence of fibrillary twitchings.

Clinical Picture.—The illness commences in the first or later years of childhood, at the age of puberty or in adolescence, rarely appearing after thirty, and, as a rule, many members of the same family are affected and the disease is often inherited through many generations. In the cases where the muscles of the pelvis and thigh and those of the erector spinæ are first involved the disorder first becomes apparent in walking and raising the trunk. The gait is waddling, going up stairs is difficult, and he falls easily. In raising from the sitting posture he makes use of his hands. There is a rather characteristic way of rising from the recumbent position. Briefly it is "climbing up one's self." Lordosis of the lumbar spine and pot belly are prominent features. These may be present in the sitting as well as the upright position. The weakness of the shoulder muscles gives rise to what has been called "loose shoulders." During rest the shoulders fall downward and forward, the scapulæ stand out from the spinal column and away from the thorax. If an attempt is made to

raise the person by inserting the hands in the axillæ, the shoulders may rise to the height of the ears. That is, the person gives the impression of slipping through the hands.

Varieties.—The most common types of the disease are: First, the pseudohypertrophic that makes its appearance in the earliest childhood, affecting chiefly the males, and involves the muscles of the trunk, the pelvis, the thigh, and the calf. The hypertrophy and pseudohypertrophy may extend over large areas of muscles, while the atrophy is limited to a few muscles of the upper part of the body.

Second, the juvenile form: Onset in youth and middle age with a preponderant involvement of the shoulder muscles and the upper arm.

The Duchenne-Landouzy-Dejerine type is characterized by the primary involvement of the facial muscles.

The hereditary form is strikingly hereditary and develops about the eighth year with weakness of the sacral region and lower extremities. There is no pseudohypertrophy.

The pathology of this disease is briefly atrophy and hypertrophy of the primary muscle-fibers, increase of the muscle nuclei, proliferation of the internal perimysium and deposit of fat cells, and ultimately entire disappearance of individual muscles.

THOMSEN'S DISEASE (MYOTONIA CONGENITA)

THE disease was first described by Dr. Thomsen. Over 20 cases occurred in four generations of his family. The condition usually begins in early childhood, but may not be noticed until puberty or later. The patients appear to be well-developed and even to have excessively large muscles, but the muscle power is not as great as one would expect in muscles of such excessive size. The essential symptom of the disease is inhibition of voluntary movements by muscle stiffness. If after rest the patient tries to set a group of muscles into activity they pass into a state of tonic contraction which cannot at first be overcome. With repetition the movements become smoother and may be carried out without difficulty. The myotonic affection is greatly influenced by emotion or by purposely forceful movements. Under great emotional stress when a voluntary movement is attempted there may occur tonic spasm of all the muscles and the person fall to the ground absolutely rigid. The myotonia may be limited to a certain group of muscles, or all the muscles may be involved. The objective findings stressed by Erb were: (1) Exaggeration of the mechanical excitability of the muscles. (2) Alteration of the electrical excitability, the so-called myotonic reaction (Myr). Galvanic excitability of the nerves is diminished from the first. Direct galvanic excitability of the muscles is increased. (3) Associated mental symptoms. Other functions of the nervous system not involved.

The pathology is hypertrophy of the primary muscle-fibers, increase of the sarcolemma nuclei, and a slight increase of the interstitial tissue. For more detailed description of this disease, reference is made to a report by Rossett (Brain, 1922, 45, 1), in which is given an excellent bibliography.

Dystrophia Myotonica.—This condition was originally thought to be an atypical myotonia congenita. In 1909 Batten and Gibb (Brain, 1909, 32, 187) and Steinert (Deut. Zeitschr. f. Nerven-

heilk., 1909, 37, 58) independently described the clinical features of this group and showed it to constitute a distinct symptom complex. It was not, however, until 1912 that Curschmann recognized the significance of the extramuscular symptoms and gave to them an importance equal to the myotonia and the muscular atrophy. According to Curschmann's description the main features of the disease are briefly: (1) Onset between twenty and thirty. (2) Facies myopathica, atrophy of sternomastoids and the muscles of the forearms. (3) Myotonia in a few muscles. (4) Loss of tendon-jerks. (5) The extramuscular conditions: (a) Cataract; (b) baldness; (c) atrophy of the testicles and impotence; (d) vasomotor disturbances; (e) general atrophy and loss of weight. (6) Course usually slow. Life rarely prolonged after forty-five. For report of cases, description of the disease, pathology, bibliography, etc., reference is made to work of Adie and Greenfield (Brain, 1923, 46, 73).

FRIEDREICH'S DISEASE (HEREDITARY ATAXIA)

Is very uncommon. Belongs to the family diseases, but is rarely directly hereditary. Onset in childhood, during the seventh to eighth year, or at puberty, with slowly developing ataxia of the lower extremities, walks with the legs wide apart, stamps and staggers. Condition progresses slowly to the upper extremities, sometimes to the muscles of the trunk and neck. Some muscular weakness may be associated with it. The ataxia may also be present in the sitting or any other position (static ataxia). Some muscular weakness may be associated with the ataxia, but this and atrophy are never marked until in the late stages of the disease. The tendon reflexes disappear. The Babinski sign is frequent. Nystagmus is usually present. Speech is slow, difficult, badly articulated, irregular, and explosive at times. Scoliosis is frequently present. There is sometimes pes equinovarus with a marked deformity of the great toe. That is, extension at the proximal phalanx and a flexion at the distal. The disease runs a very slow course, may last thirty or more years. In the later years patient may be confined to bed. Prognosis is wholly bad.

Pathology.—A combined disease of the posterior and lateral columns, usually degeneration of the lateral cerebellar tracts, lateral pyramidal tracts, Clarke's column, and the entire columns of Gall and Burdach.

CONCLUSIONS

This is a family of the neural progressive muscular atrophy group (Charcot-Marie-Tooth disease).

Other degenerative evidences are hypospadia in the oldest child, and optic atrophy in Case IV.

This clinic illustrates the importance of differentiating cases belonging to the heredofamilial groups in instances presenting motor system defect.

Such families should be handled from the standpoint of the ability of each individual to adjust himself to the necessary duties and activities of life.

Occupations requiring the minimum use of the affected muscles should be selected. Guard against over-exertion. Much benefit may be derived from systematized exercises. There are no specific drugs. Galvanism is recommended by some, but is of doubtful value.

Impaired function rather than deformities determines orthopedic procedures. Tenoplasty with arthrodesis has given good results in some cases.

CLINIC OF DR. RALPH KINSELLA

ST. MARY'S HOSPITAL (UNIVERSITY HOSPITAL, ST. LOUIS UNIVERSITY
SCHOOL OF MEDICINE)

THE CLINICAL IMPORTANCE OF THE RELATION BETWEEN THE CONNECTIVE TISSUE OF THE STOMACH, DUODENUM, PANCREAS, LIVER, AND SPLEEN

PATIENT, S. J., is seventy-five years old. He has been a laborer all his life, obtaining most of his employment when a young man in digging sewers. He indulged freely in the use of alcoholic beverages when a young man, but denies venereal disease and, indeed, has had many negative Wassermann tests. He says he had malaria, or at least "chills and fever" between the ages of twenty-five and fifty and during that time took a large amount of quinin. No other illnesses are recalled up to the time of the present illness. He was always thin, never weighing more than 138 pounds.

He enters the hospital at present on account of hemoptysis, and x-ray of the lung reveals chronic tuberculosis in the left upper lobe. Besides this rather acute event, there are interesting conditions below the diaphragm which are related to each other, and which have been responsible for twenty-three years of suffering and disability. Their appearance has been of slow development, and what is especially interesting, it is possible to go back in his records to the time when he did not show this or that particular sign. During these twenty-three years he has been a patient in our hospital eight times, and in Barnes and Washington University Hospitals an equal number of times.

You see here a slender, hyposthenic type of individual with hair that is very black considering the age—who is apparently weak, but not particularly "short of breath"; and there is no

edema of the ankles. There are two scars in the upper abdomen, one on the right side, the other to the left, of the midline. The first scar is the result of an operation performed for the removal of gall-stones, which, however, were not present; the second scar is the result of an operation for posterior gastro-enterostomy.

You see that this abdomen is moderately full, with dulness in the flanks, suggestive of fluid, and there is a dilatation of veins about the umbilicus which suggests that the fluid may be produced by portal obstruction. On examining further, the liver is felt to be enlarged, coming down to a level 4 cm. below the ribs in the midclavicular line. Furthermore, the spleen is easily felt at the left margin, being hard and not tender. A mild secondary anemia exists.

Taking these facts alone, one might easily be led to think of Banti's disease even without knowing that hemorrhages from the stomach frequently occurred in this patient in the past.

But the patient has diabetes as well, and we have been prone to associate chronic gall-bladder disease, with its accompanying hepatitis, with chronic interstitial pancreatitis in the diabetes which occurs late in life. What is the connection, anatomically, between such pancreatitis and hepatitis? How can the former be caused by the latter? How could a picture simulating that of Banti's disease be woven into such a background? A study of the history of this case does much to throw light on these questions.

At the age of fifty-three (twenty-two years ago) this patient began to have pain in the right upper quadrant with vomiting. The records of the time do not state whether the vomitus was bloody. One doctor thought the condition due to "gastritis"; another, because the pain radiated to the back and right shoulder, thought there were gall-stones. After suffering one year the patient submitted to an operation for gall-stones. The appendix and gall-bladder were removed, but there was no gross pathology in either structure. The operator made a diagnosis of carcinoma of the head of the pancreas on account of the hard enlargement in that area. Within three months the symptoms returned, at this time the vomitus became bloody, and at different times during

the next six years there were several hemorrhages followed by fainting, and later by secondary anemia. During this time the free HCl in the stomach contents remained at a level of 20 to 30, and one x-ray failed to reveal pathology in the stomach or duodenum. On one occasion a diagnosis of carcinoma of the stomach was made. Six years after the first operation, when patient was fifty-nine years old, another barium fluoroscopic examination made by the same examiner resulted in a failure to visualize the pyloric antrum and cap, and a second operation was performed. The operator described the duodenum as a "thin scar tract," found the transverse colon adherent to the anterior abdominal wall, and a gastro-enterostomy was effected. Thereafter there were attacks of pain and vomiting which have never entirely disappeared, but no further hematemesis has occurred. The persistence of the pain would seem to indicate persistingly active and spreading pathology.

A transitory glycosuria was encountered in 1916. On one occasion only during many daily urinalyses a heavy reduction of copper was obtained, but the matter was dismissed as accidental. In 1922 three urinalyses failed to show glycosuria.

In 1923 a high blood-sugar value was discovered without accompanying glycosuria, but since 1924 patient has been an outspoken diabetic, though of only moderate degree. On account of the low work requirements of a man of his age he can use a balanced diet of 2000 calories without glycosuria. His blood-sugar remains near 145 unless intercurrent affections cause its increase, when values of 225 have been recorded.

Here we seem to have witnessed the origin of clinical diabetes based, no doubt, on interstitial pancreatitis. The latter seems logically to have followed from the interstitial duodenitis. Such spread has frequently been said to be due to lymphatic connections, but inasmuch as the spread of the disease is in a direction opposite to blood- or lymph-flow a direct extension by contiguity of tissue, by "drift," seems more plausible. This patient emphasizes the fact that interstitial pancreatitis may result from disease in the duodenum. Does this interstitial duodenitis spread in other directions?

We have encountered 2 cases in the past two years where interstitial gastritis of advanced grade was found at autopsy in patients with duodenal ulcer. This gastritis takes the form of a submucous infiltration by the elements of chronic inflammation and spreads from and is continuous with the submucous infiltration in the duodenum. We have had the opportunity frequently, with Dr. Collier, to observe interstitial pancreatitis in cases of duodenal ulcer and clinical diabetes. In reviewing 100 consecutive autopsies of adult patients in 1925, 14 cases were studied in which an almost connecting infiltration could be demonstrated which spread through the duodenal submucosa, the pancreatic interstitial tissue, and the interstitial connective tissue of the liver. This represents an interesting situation capable of varied clinical expression and somewhat analogous to that infiltration which begins above the diaphragm in the pleura or pericardium and spreads finally to the capsule of the liver.

The combination of large liver and large spleen is interesting because of the absence of any evidence of syphilis, and the further fact that this enlargement has developed only in recent years. Italian clinicians have emphasized tuberculosis as an etiologic factor in chronic splenitis, and in this case there is sufficient evidence in the lungs to support such an explanation. Perhaps a chronic peritonitis, incited by the trauma of two operations, has been slowly developing and is responsible for the mild ascites which is present. When the second operation was performed the transverse colon was found adherent to the anterior abdominal wall, and there was difficulty in separating the adhesions preparatory to gastro-enterostomy. This chronic inflammation undoubtedly continued to develop after the second operation and may easily have reached the spleen. The case at least invites several considerations as a basis for the present splenic enlargement, the ascites, portal obstruction, and hepatic enlargement: First, the original inflammation about the duodenum may have spread along the splenic vessels as well as toward the liver and pancreas; second, chronic peritonitis may be responsible for the changes in the liver and spleen; third, tuberculosis

may be the most important factor. Only the autopsy can settle this discussion.

In reviewing such a case one is impressed with certain facts which are of the highest value in diagnosis.

The physicians who saw this man fifteen years ago were impressed by the possibility of cancer. Subsequent events and the duration of life have made such an assumption untenable. But the fact that stands out in reviewing the many examinations is the persistence of free HCl. We can regard this as assuring evidence of the absence of malignant involvement of the stomach.

The early physicians to this man were impressed by the pain radiation to the right shoulder-blade. On this evidence more than on anything else was the diagnosis of gall-stones made. Yet there was no pathology in the gall-bladder. Where does the pain originate in gall-bladder colic? Is it due to sudden engorgement of the bile capillaries? Is it due to duodenal spasm? In the present case there was no evidence of involvement of the biliary system. There was obviously reason for duodenal spasm. The relief which we have observed following the use of atropin in true gall-bladder colic is further suggestive of the relaxation of a larger muscular structure such as the duodenum.

The nature of Banti's disease is suggested by this case. At least, a case so diagnosed should be regarded simply as a syndrome capable of being produced in a non-specific way by chronic inflammation of a type existing in this man.

Finally, from what we have said, it is useful to emphasize again, as we frequently have in the past three years, the clinical usefulness of considering how intimately related, and capable of joining in a common inflammatory process, is the connective tissue of the stomach, duodenum, pancreas, liver, and, to a less extent, the spleen.

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CLINIC OF DR. ALBERT E. TAUSSIG

FROM THE MEDICAL SERVICE OF THE JEWISH HOSPITAL

PURE CONGENITAL DEXTROCARDIA

PURE congenital dextrocardia is an interesting and somewhat rare malformation, one of its two varieties being far rarer than the other. It must be distinguished, as its two adjectives imply, first, from situs inversus, whether partial or complete, in which the transposed heart is only one of a number of transpositions; and second, from acquired dextrocardia, in which the heart is pulled or pushed into the right side of the chest by postnatal disease. Cases have also been reported¹ in which a similar dislocation was produced by antenatal malformations or disease, such as absent, cystic, or atelectatic right lung, left diaphragmatic hernia, antenatal inflammatory adhesions, and the like. All of these conditions can readily be made out on physical or x-ray examination and do not concern us here.

A case of pure congenital dextrocardia was recently seen in consultation with Dr. Adrian Bleyer. The patient, a little girl of four years, looked and felt entirely well. She had had a colitis during her second summer, and a pneumonia at three years. In August, 1926 she had an acute febrile attack with vomiting; no focal symptoms. A week later her face and abdomen became swollen; there was rapid respiration, tachycardia, but no fever. No information was obtained concerning the urinary findings at that time, but the mother's description of the symptoms suggested an acute nephritis. A physician, who was summoned, diagnosed acute endocarditis, probably because of the presence of a heart murmur, and quite possibly erroneously. She was ill for only a few weeks and has felt entirely well ever since.

¹ Foggie, W. E.: Congenital Dextrocardia, *Edin. Med. Jour.*, N. S. 5, 428-449, November, 1910.

When first seen, in October, 1926, she looked the picture of health; temperature normal, pulse 100. Physical examination, in brief, was as follows:

Complexion fair, but not pale; pupils normal; mucous membranes normally pink; the pharynx negative except for moderately enlarged tonsils. There was a little cervical adenopathy; no goiter.

The thorax was symmetrical; the lungs clear. The area of cardiac dullness was the reverse of that normally found, extending in the fifth intercostal space 7.5 cm. to the right and 4.5 cm. to the left of the midsternal line; there was no retromanubrial dullness. The point of maximum impulse was in the third interspace a little to the right of the sternum; there was no impulse to the left. A loud systolic blow could be heard over the entire precordium, loudest over the sternum at the level of the third rib, not transmitted into the carotids or axillæ. The second sounds were normal; the rhythm regular.

The abdomen had a normal contour; the liver appeared to be in normal position; the spleen could just be felt on deep palpation at the left costal margin.

The extremities were negative; there was no clubbing of fingers or toes.

A diagnosis was made of congenital heart disease of undetermined nature, with dextrocardia. This was confirmed by a 7 foot x-ray film which showed normal lung fields; a heart shadow which was the mirror image of the normal heart, and extended at its maximum width 6 cm. to the right and 3.7 cm. to the left of the midline; the liver was in normal position, as were also stomach and colon, visualized by means of barium.

The electrocardiogram was essentially normal.

Pure congenital dextrocardia may be of two varieties. The more common form, of which something over a hundred cases have been reported and to which the above case belongs, has been best described by Nagel.¹ In this form the position of the heart is nearly that which it occupies in fetal life. At about the second

¹ Nagel, Martin: Beiträge zur Kasuistik und Lehre von der angeborenen reinen Dexio-cardia, Deut. Arch. f. klin. Med., 96, 552-586, July 15, 1909.

month the fetal heart occupies an almost symmetric position, the left chambers lying to the left and the right chambers lying to the right of the midline, the interventricular septum pointing almost anteroposteriorly, with just a little inclination to the right. After this period the apical portion of the heart grows rapidly and, in so doing, ordinarily swings to the left until, later in fetal life, the heart occupies its usual normal position. Occasionally, however, for some unknown reason, the apex swings toward the right, producing the phenomenon of dextrocardia. There is here, however, no mirror image of the normal heart, such as we find in situs inversus. Those chambers which receive their blood from the peripheral circulation still occupy the right side of the heart, and those that get their blood from the lungs, the left. The electrocardiogram, as in our case, accordingly is that of the normal heart.

An interesting feature of these cases is the very great prevalence in them of congenital cardiac defects; indeed, nearly all the cases reported show a patent ductus Botalli, open foramen ovale, defective interventricular septum, or the like. Many of the patients show the clinical results of these lesions: Cyanosis, dyspnea, clubbed fingers and toes. Others, however, remain perfectly compensated; of Nagel's 24 cases, 10 were first recognized in their third, fourth, and even fifth decades. The causal relation between these defects and the dextrocardia remains obscure. The former can hardly be the cause of the latter, for then, with the relative frequency of congenital heart lesions, dextrocardia, too, should be more common.

The other type of dextrocardia is excessively rare. Indeed, until recently the most careful observers were inclined to doubt its existence. In this form, as in situs inversus, we have a true mirror image of the normal heart, while all the other organs occupy their normal positions. Here that side of the heart which receives its blood from the peripheral circulation occupies the left side, while that which gets its blood from the lungs lies on the right. Accordingly the electrocardiogram is reversed; in the first lead all the waves are inverted, while the second and third leads interchange their characteristics, the well-known findings of

situs inversus. Since the two forms give identical findings on physical and x-ray examination, they can be distinguished only at autopsy or by means of the electrocardiogram. In the older literature 2 cases, those of Otto (1816) and of Graanboom,¹ have been supposed to belong to this group on the basis of postmortem findings, but probably wrongly so. Otto's report is not accessible to me, but Nagel maintains that Otto's data are too scanty to justify any conclusions. Graanboom's case has always been considered a classical example of this form of dextrocardia. A careful analysis of his description and of his drawings shows, however, that his case belongs quite definitely to our first group. I have been able to find only 2 unquestionable cases of situs inversus involving the heart alone. P. Meyer² in 1923 reported such a case in a perfectly healthy girl of seventeen. Moffett and Neuhof³ report a boy of three and a half years with patent interventricular septum, cyanosis, and clubbed fingers. Unfortunately the second and third leads of their electrocardiogram were lost; the first lead, which they publish, seems characteristic enough.

¹ Graanboom: Ein Fall von Dextrocardie, etc., *Ztschr. f. klin. Med.*, 18, 185-192, 1890.

² Meyer, P.: Dextrocardie pure isolée avec inversion des cavités cardiaques, *Arch. des mal. du cœur*, 1923, 249-255.

³ Moffett, R. D., and Neuhof, S.: *Amer. Jour. Dis. Child., Congenital Dextrocardia*, 10, 1-15, July, 1915.

RENAL GLYCOSURIA WITH KETONURIA

It has long been known that glycosuria may be produced by two causes that have no direct bearing upon each other. It may be due to a hyperglycemia, with a normal or supernormal threshold. This is the case in diabetes mellitus, and in the condition of benign alimentary hyperglycemia to which Faber¹ was one of the first to call attention. On the other hand, glycosuria may be produced by a depression of the renal threshold, so that sugar appears in the urine even though the blood-sugar level remain normal. This condition is apparently not related to diabetes, but is a harmless anomaly. The individuals so affected remain in good health on an unrestricted diet.

If this depression of the glycosuria threshold is comparatively slight, the blood-sugar level when fasting and often between meals will not be sufficiently high to lead to the appearance of sugar in the urine. The result will be the production of an alimentary or so-called cyclic glycosuria. If, on the other hand, the threshold is below even the fasting blood-sugar level, a continuous glycosuria will result. Since in health the maximum blood-sugar level is practically independent of the amount of carbohydrate ingested, the same will be true of the glycosuria produced when the threshold is lowered.

This last condition is what is known as "renal glycosuria," and uniformly shows the following phenomena:

1. A constantly normal or subnormal blood-sugar level, responding normally or less than normally to the ingestion of large amounts of dextrose.
2. A constant or nearly constant glycosuria, independent, or nearly so, of the carbohydrate intake.

¹ Knud Faber: Benign Glycosuria Due to Disturbances in the Blood-sugar Regulating Mechanism, *Jour. Clin. Invest.*, 3, 203-228, December 20, 1926.

3. The absence of all symptoms of diabetes and the uniformly benign character of the abnormality.

4. The normal utilization of carbohydrates as shown, above all, by calorimetric methods.

Such cases of renal glycosuria have been reported in considerable numbers, and will doubtlessly be more and more frequently observed as the use of blood-sugar determinations becomes more wide-spread. The case to be presented, however, shows two interesting peculiarities that would seem to make its discussion worth while.

The patient, a young Russian Jew, aged thirty-one, has never been seriously ill. He knows of no other case of glycosuria in his family. In May, 1917 he entered the Jewish Hospital for a peritonsillar abscess. During the routine examination a glycosuria was found and he was assumed to be a diabetic. His urine was easily made sugar free and he was discharged on a moderately restricted diet. In July and September of 1917 he was again referred to the hospital because of his glycosuria; each time he was readily made sugar free. During the following years he felt entirely well. He did not restrict his diet in any way and at no time had any symptoms suggesting diabetes. On March 3, 1927 he was admitted to the surgical ward of the Jewish Hospital suffering from a fractured clavicle and numerous abrasions the result of an automobile accident. At this time the urine was found to contain nearly 3 per cent. of sugar, much acetone, and diacetic acid; the fasting blood-sugar, however, was only 94 mg. per cent. He was first put on a diet of protein 24 gm., fat 50 gm., carbohydrate 20 gm.; later each ingredient was doubled; then came two days of starvation; and finally a basal diet with small doses of insulin. Under all of these regimens there was a moderate reduction in the sugar output, but the ketonuria persisted. He was accordingly transferred to the medical service for study.

Here, on a diet of protein 40 gm., fat 90 gm., and carbohydrate 110 gm., the acidosis disappeared while the glycosuria persisted. A tolerance test, during which 100 gm. of dextrose

(2.3 gm. per kg. body weight) were administered, gave the following results:

	Blood-sugar, mg. per 100 c.c.	Urine-sugar.
Fasting.....	76	0.1 per cent.
Half hour after dextrose.....	114	0.25 gm.
One hour after dextrose.....	155	1.50 "
Two hours after dextrose.....	151	0.78 "
Three hours after dextrose.....	93	0.25 "
Four hours after dextrose.....	91	0.25 "
Five hours after dextrose.....	76	0.03 "

This blood-sugar curve is, to all intents and purposes, normal, and the continuous presence of sugar in the urine showed the case to be one of renal glycosuria. He was given varying amounts of carbohydrate without much change in the sugar output, as shown in the following table; each period lasted five days.

Period.	Diet.			Average urine output in twenty-four hours.	Average sugar output in twenty-four hours.
	P.	F.	C.		
1.....	47	160	45	850 c.c.	2.2 gm.
2.....	47	160	145	870 "	1.8 "
3.....	46	70	300	1100 "	2.1 "
4.....	50	70	500	1780 "	3.7 "

The patient thus presents the typical picture of renal diabetes. There are, however, two interesting features that deserve further discussion. When the patient entered the hospital the two outstanding features, aside from his injury, were the glycosuria and the ketonuria. Both acetone and diacetic acid were reported as ++++ in the urine and persisted unchanged for a number of days. This led, with some justification, to the preliminary diagnosis of diabetes mellitus, in spite of the normal fasting blood-sugar. Ketonuria in renal glycosuria, while rare, is not quite unknown. Allen, Wishart, and Smith,¹ in their careful study of 3 cases, found minute quantities of acetone and diacetic acid repeatedly. The amounts, however, were almost or quite within the limits of the normal. Patterson² reports a case

¹ Allen, F. M., Wishart, M. B., Smith, L. M.: Three Cases of Renal Glycosuria, *Arch. Int. Med.*, 24, 523-544, 1919.

² Patterson, J.: A Case of Renal Glycosuria with Ketonuria, *Lancet*, 2, 596-597, September 19, 1923.

of renal glycosuria with the constant excretion of acetone and diacetic acid for a considerable number of days on all diets. From the very brief report of the case no definite cause for the acidosis can be determined. Goldbloom's¹ case was an infant, twenty months old, brought to the hospital with an acute respiratory infection; the urine contained sugar, acetone, and diacetic acid. The ketonuria vanished with the fever; the glycosuria proved to be of the "renal" type. Here we are not justified in assuming any connection between the two urinary abnormalities. The acidosis may well have been due purely to the acute infection. In my case, too, the acidosis was probably accidental, and due primarily to the trauma to which he had been subjected. It may have been prolonged by the low carbohydrate diet upon which he was put in the surgical service; at any rate it ceased promptly when the carbohydrates were increased. The matter is of importance only because it again illustrates the point that, because a patient shows glycosuria and acidosis, we must not, therefore, assume that he has a diabetes mellitus.

The second interesting feature is the curious behavior of the urine sugar on April 4th and 5th. The patient, it will be remembered, had been putting out about 2 gm. of sugar daily on a variety of diets. Suddenly, without any variation in the diet, the urine sugar rose to over 13 gm. on April 4th and fell below 1 gm. on April 5th. At first we accused the patient of having gone on a candy debauch, though it is doubtful whether this would have produced such a glycosuria. He denied the accusation earnestly, but volunteered the information that he had been greatly worried and harassed all day by private and family troubles. If this is the explanation of his increased glycosuria it would be of some interest. Emotional glycosuria has long been known in diabetics, but has also been found in healthy individuals. In 1911 Cannon, Shohl and Wright² found that normal cats, after being furiously excited, excreted sugar in their urine. Cats

¹ Goldbloom, A.: Renal Glycosuria in an Infant Twenty Months of Age, *Canad. Med. Assoc. Jour.*, 14, 950-952, October, 1924.

² Cannon, W. B., Shohl, A. T., Wright, W. S.: Emotional Glycosuria, *Amer. Jour. Physiol.*, 29, 280-287, December, 1911.

whose adrenals had been removed could, however, be baited without excreting sugar. They concluded that the phenomenon was an example of adrenal glycosuria. Folin, Denis, and Smillie¹ made some interesting observations on a number of boys and girls before and after a college examination. Before the examination all had normal urines; after the examination 17 per cent. of the girls and 18 per cent. of the boys showed glycosuria. The amounts of sugar found were, however, always small. The increased glycosuria in our case, if emotional, was far greater than would be expected in health. The curious drop below the usual glycosuria level on the day following the increased output remains unexplained.

SUMMARY

A case is reported of pure congenital dextrocardia, of the embryonal type, since its electrocardiogram was normal.

The second case, a renal glycosuria, showed on admission a marked acidosis, probably due to trauma, and later a greatly increased glycosuria, probably on an emotional basis.

¹ Folin, O., Denis, W., and Smillie, W. G.: Some Observations on Emotional Glycosuria in Man, *Jour. Biol. Chem.*, 17, 519-520, 1914.

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CLINIC OF DR. SIDNEY I. SCHWAB

BARNES HOSPITAL (WASHINGTON UNIVERSITY)

PSYCHIATRIC SYMPTOMS IN MEDICAL OR SURGICAL DISEASES

THE neurologic service in a general hospital is constantly asked to note and interpret psychiatric symptoms arising in the course of medical or surgical conditions. In an active service such consultations furnish some of the most interesting problems which the psychiatrist has to meet. This clinic will be devoted to a consideration of some of the diagnostic and therapeutic questions which arise when a patient develops symptoms of mental disease that are manifestly disconnected from the condition for which he entered the hospital. Almost any sort of surgical or medical illness may suddenly or gradually become a psychiatric problem. Indeed, almost any type of psychosis may spring into activity in the course of a patient's illness. It is surprising how frequently this happens, and it is still more surprising how ill-prepared the average hospital is to take care of such emergencies when they arise. In only a few general hospitals is there a ward or series of rooms adequately fitted for the reception of acute mental states that so often develop in a service given over to the average lot of medical or surgical diseases. It is a curious commentary on the blindness of hospital administration that the point is not appreciated that adequate treatment of the mental emergency often carries with it the final success of the medical or surgical condition which, for a time at least, may be completely masked.

In selecting from a large group of cases which belong to this class, an effort will be made to consider only fairly typical cases, and as large a selection of varying material will be made as the 5 case reports will permit. The mental conditions which this

group illustrates are not confined to the acute deliria which is perhaps the most common of all the psychoses met with in a non-psychiatric group of cases, but with the psychoses of gradual onset and slow development. The acute medical or surgical illness or even chronic conditions under hospital régime give a chance for a psychosis to make itself plain when before entrance it was hidden from scrutiny and, therefore, did not become the object of psychiatric inquiry. In the course of this clinic a number of questions will automatically arise out of the material itself. These questions will be answered in detail in the case reports. In a general way, however, some of them should be stated now because their answer is perhaps the most important part of this clinic.

Are the psychiatric states that arise in the course of a surgical or medical illness caused by that illness, and should they be regarded as symptoms in the same way as are other symptoms?

Are there any specific or characteristic mental symptoms associated with different types of diseases not of themselves psychiatric conditions?

Are mental symptoms due to the disease in which they occur, or are they the products of associated infectious states, fatigue, or general weakness?

Are the psychiatric conditions due to the awakening of dormant psychiatric trends which needed an experience of acute illness to stimulate them into clinical activity and make them clinically recognizable?

Does an acute illness temporarily mask a psychiatric condition or render it less recognizable and, when the acute stage is passed, permit again its emergence?

Are some of the psychiatric conditions the consequences of the mental attitude which illnesses of certain kinds create either as a result of their character, severity, suffering, or hopelessness?

These are some of the questions which naturally arise when the psychiatric states requiring investigation present themselves. All of these cannot, of course, be accurately answered from the 5 case reports submitted, but a general notion of both the import

and the answer to them might be obtained even from so few cases and from so brief a clinical description.

Case I.—Acute psychosis in a case of severe trauma of spine and pelvis. The first case is a psychosis developing in the course of an acute surgical condition. A miner, fifty-six years old, while working in a coal mine was struck in the right lumbar region by falling coal and slate. He crumpled up on the slate pile feeling as if everything below his waist was paralyzed, but did not lose consciousness. He was rescued by his fellow workmen. The slightest movement caused pain. He was taken to the Barnes Hospital and admitted to the surgical service, where x-ray examinations showed fractures of the lumbar spine, transverse processes, multiple fracture of pelvis, and fracture of the ilium. The urethra was likewise injured. The pelvis was elevated by sling with overhead traction. He improved rapidly, pain gradually lessened, the urethral wound healed, urine cleared, he was passing sufficient amounts; sleep improved, appetite returned, and he was eating satisfactorily. There was no temperature. Urine became normal, as were leukocyte and blood-counts, N. P. N., which was 52.6 on entrance, came down to 28.6; blood-sugar 0.084. He seemed well on the way to recovery and the acute surgical condition appeared to be taking care of itself, needing only the proper regulation of a slow convalescence. On December 21st, after a week in which sleep was normal, he began to show evidence of restlessness. In the following week it was noticed that he could not sleep. In spite of increasing amounts of the ordinary hypnotics, and this included morphin, no improvement of the insomnia resulted. On December 19th the first evidence of mental disturbance was noted. This was about three weeks after the accident and one week after his surgical improvement, that is, after the acute symptoms caused by his serious accident had disappeared. His mental state is described as irrational. He refused food and all medicines, became noisy and disoriented. He began talking at random, accusing doctors and nurses of making fun of him. He completely changed from a patient easy to take care of to one presenting many difficulties

in the way of adequate surgical care. Insight into his condition disappeared. He insisted on moving about the bed, refused to keep on bandages, threw himself from side to side, often with violence. He wanted to get out of bed, spat out food, threw his catheter on the floor, and had to be held in bed. He became noisy, using foul language, developed persecutory ideas, hallucinated in both the visual and auditory spheres, and showed the typical picture of an acute psychosis with hallucinosis. A neurologic note made at that time contains the following: "Patient is in a state of acute delirium, noisy, talkative, gesticulating, and hallucinating. States of acute excitement alternate with states of quiet and almost stupor, from which he is aroused with difficulty. Then activity begins again, during which he throws the covers off, tears away his bandages, throws himself about, making efforts to get out of bed. These periods are succeeded again by short lapses of quiet sleep and slight stupor." For a few days after this note was made he showed no change, but gradually the stuporous-like states grew longer and the excited periods shorter. Even in this period of apparent improvement periods of acute mental excitement made their appearance. He threatened and tried to cut his throat, he heard voices which were threatening him, would go through the motions of telephoning, often calling out for assistance, and evidently under the impression of persecutory delusions. The intermittency of the attacks of mental excitement seemed to lengthen, he began to recognize faces, knew his doctor and nurse, took food, and apparently began to have an inkling of insight into his condition. On January 27th he was discharged under protest and his mental condition is described as improving. The subsequent history of this patient is not known.

Several interesting questions are presented in a case of this sort: What is the acute psychosis? How does it come about? What is the way to handle it? What is the ultimate outcome likely to be? It is easy enough to call this an acute delirium, a term merely descriptive of the picture presented. Acute delirious episodes are met with in many types of psychosis and in many acute infectious diseases. The febrile

deliria are all of that category. They ordinarily subside after the febrile stage is over or after the infectious process has subsided. Ordinarily they carry with them no ultimate mental residuals and patients are mostly unaware of such an episode after it is over. In this case, however, there was no evidence of an acute infectious process and no infection that could be brought into relation with the acute psychosis. Exhaustion was not an important factor, as the process was much too acute. There is much needed information in a case of this sort which might throw light on the present condition. It is more than likely that in this patient's past history there have been similar episodes, and this present one, which perhaps can best be described as an acute manic state associated with confusion and hallucinosis, is simply a phase in a manic-depressive psychosis brought to light and flamed into activity by a violent physical and psychical shock. The past history is of the greatest diagnostic importance. These data were lacking, and the patient could not be studied, therefore, except from the point of view of the present manifestations which were obviously insufficient to furnish either a correct diagnosis or a prognosis.

This case suggests, therefore, that in all acute surgical traumatic conditions search should be made for the presence of psychiatric episodes or diseases so that the possibility of their occurrence might be provided for. This would be a comparatively easy thing to do if that sort of information were regarded as a necessary routine in getting a complete history. The handling of this case presents no particular difficulty if the main problem, which is surgical, be kept constantly in mind. Obviously the main therapeutic aim is to keep the patient from interfering with normal surgical convalescence. This would be to prevent him from doing himself surgical injury. In such a case restraint is absolutely necessary, and there should be no hesitation in placing him in a restraining sheet as soon as the necessity for this procedure becomes evident. This should be done before the patient has succeeded in damaging himself by dangerous movement and risky manipulations. Sleep and suffi-

cient food and liquids are the next requirements. The safest quieting drug is paraldehyd, given in sufficient amounts to keep the patient sleeping or at rest. As much as 30 c.c. can be given at one dose if necessary, and this can be repeated as long as it is required, the dose to be regulated by the patient's need. This drug can be given with any amount of liquid, and in a case such as this it was given with a nasal tube. Food, paraldehyd, and liquid can in this way be continuously given provided the patient is restrained in such a way that he cannot interfere with these procedures. It is understood, of course, that the restraint is only to be used if the patient is in danger of damaging himself or interfering by his manipulations with surgical necessities, that is, proper position, prevention of movement, etc. Paraldehyd should be given with caution in cases of suspected pneumonia or where the stupor that it produces might interfere with expectoration, or where there is danger in lowering respiratory rate. Paraldehyd in rare instances lowers respiratory rates. The only fatal cases of overuse of paraldehyd observed in the neurologic service in which a large experience with this drug has been obtained has been in cases of unrecognized pneumonia. There have been two such instances in many hundreds of cases. This case is of interest because it brings up the question of the necessity of accurate psychiatric information in regard to the past history of acute surgical traumatic conditions. The medicolegal bearing of this information is evident.

Case II. Psychiatric Picture in Pellagra.—In the past year there have been 5 cases of pellagra in the medical service of the Barnes Hospital. Of these, 3 showed definite mental symptoms. An analysis of the mental states in pellagra may be illustrated by the following case. This will also furnish an opportunity to discuss the psychosis present in pellagra in general. The present case deals with one of two sisters, both of whom had pellagra and both definite psychiatric symptoms. One of the cases is selected because it shows perhaps more characteristically than the other typical mental changes. The psychosis in this case is

due to a wide-spread degenerative disease affecting the organism as a whole and incidentally the nervous system. Whatever term is used as a description of the psychosis it represents the effect of the disease on the functions of the nervous system. It responds in the line of altered response, and the intellectual defect thus produced is the psychosis of pellagra. This is shown in both conduct defects and in mental content. Autopsies were obtained in both cases. (This case will be described as if she were now living.) This is a woman thirty-seven years of age who came to the Barnes Hospital from a southern state. On entrance she is very emaciated, weak, and out of her mind. Legs are stiff and rigid. The right arm is seen to be in almost continuous movement, a kind of threshing, choreiform twitching of large excursion. The movement is aimless, automatic, and is present to some extent during sleep. Examination is resisted. Dusky pigmentation over face and neck. The hands show dirty brown pigmentations, extending above the wrists. Skin is here thickened, cracked, and bleeding. Over the legs up to the knees there is a faded irregular pigmentation.

Up to five years ago this patient was apparently well. On account of constipation she has restricted her diet to toast and Cream of Wheat. She has not eaten fresh fruits or vegetables or meat in this interval. December is set down as the beginning of the present illness. About then she began to get progressively weaker with generalized muscle pains. Headache in both parietal regions. Two weeks before entrance she had convulsions. There is no data on their nature, kind, or violence. Choreiform movements began at about this time, probably after the onset of the convulsions, which then abruptly ceased. The chief physical findings apart from the pellagra lesions are secondary anemia, low blood-pressure, 90/60, and changes in the urine suggestive of nephritis. The only neurologic point of interest aside from the choreiform movement of one arm is a persistent Babinski reflex on the left which is the side of the choreiform movement. At entrance it was noted that she was disoriented, dull, stupid, with some suggestion of negativism. She lies quietly in bed, twitching right arm and hand; occasionally in the

distribution of the platysma muscle. There are some movements of jaw, lips, and facial muscles. Speech high pitched and whiney. Understands questions or appears to get their import, but generally answers them wrongly. Disorientation is complete. She has not the slightest idea where she is, what time it is, or for what purpose she is brought into the hospital. She thinks she is at home and recognizes the people about her as her old acquaintances. Memory is gone. She has apparently a number of delusions, but it is impossible to determine their nature and organization. She becomes emotional when in a partly understood fashion she tries to give expression to them. She shows occasional environmental interests, but again lapses into her confused state. She lacks any interpretative sense in regard to these reactions. During the day her conduct is fairly normal in the way of conforming to ward regulations. She is then easily controlled. During the night she is managed with great difficulty. She lies awake most of the night, restless, noisy, screaming and gesticulating, shaking her hands and arms, and attempting to tear her gown. Often she sinks into a mumbling and whispering kind of delirium, crying suddenly and violently. It is always hard to feed her. She will take nothing but liquids, and at sight of the high protein diet that is essential for treatment she becomes almost unmanageable. She died with respiratory failure the sixth day after admission. Her sister, the tenth day. The postmortem showed the usual emaciation of a progressively fatal disease. Typical pellagra skin lesions. Normal heart and lungs, granular kidney. From ilium to cecum were many small ulcers with hemorrhage. Gas bacillus growth in ilium and colon. The brain and medulla were normal both in gross appearance and microscopically.

The mental symptoms in both the cases were so nearly alike that they may be considered as characteristic of the terminal mental state in this disease. It is the pellagra psychosis in the chronic progressive form of this disease, because the acute mental symptoms which have just been described are probably the termination of a more chronic mental change, data of which could not be obtained in either of these 2 cases. Acute exhaustive

infection or toxic delirium may well describe this terminal phase. This was simply the end of a chronic mental deterioration depending upon a like series of changes going on in the total organism, including the nervous system. In such conditions the functions of the brain show the identical manifestations as does the rest of the organism. The response to the lowered functional state of the brain is in terms of defect in mental co-ordination and in the normal associated processes. Confusion, emotional reactions of an abnormal kind, mental enfeeblement, and conduct distortion follow. The resulting psychiatric picture is individualized, but through it all runs the thread of general decline in intellectual capacity, in emotional balance, and in conduct adjustment.

Case III. Psychosis in a Case of Organic Heart Disease.—

Various sorts of psychical and neurotic conditions have been observed and described in heart disease. The emotional phase of organic disease of the heart has always been recognized; the psychoses, on the other hand, have not been given nearly enough attention. A psychosis in organic heart disease has but a distant relationship to the type and character of the heart lesion except in one group of cases. In an aortic valvular lesion, for example, the ease with which emboli can be sent to the brain structure is understood. In such conditions in which lesions of the brain can be produced, and if the localization is of such a nature as to produce mental symptoms, then the psychosis which finally results is related to organic changes in the brain itself. Such conditions are not puzzling, though often the clinical picture may be difficult to interpret. Likewise the mental symptoms in cardiac decompensation of an extreme sort in which there is a combination of generalized edema, nephritis, and the rest of the picture, are such as can be recognized and as easily interpreted. On the other hand, there are cases of organic heart disease in which a definite psychosis develops which cannot be said to have any relation to definite structural changes in the brain itself and which form a distinct part of the clinical picture. The psychiatric symptoms seem to be attached to

the natural despondency which is so frequently found in severe heart conditions. This case illustrates very well the development of a complex organized psychosis as a part of the clinical picture of heart disease, but which is not caused by any organic changes in the brain itself.

A man aged fifty-three was sent into the ward from the Out-patient Department to determine whether his condition is one of cardiac neurosis. This patient has been treated in the Out-patient Department for decompensation, and his chief complaint is a jumping heart, inability to sleep, and restlessness. His early history should be stressed, because it has much to do with the more acute symptoms which developed in the course of his present condition.

He was the second of three children and his early schooling was fragmentary and defective. He was always fighting, playing hookey, and getting otherwise into trouble. He seems always to have had a bad temper, was always getting into fights, and very early he began to realize that he was disliked and that his environment was antagonistic to him. His father died when he was three years of age and he began early to realize that there was a definite antagonism between himself and his brothers. "All that I got from them," as he describes it, "was a kick and a shove." He stopped school at twelve. All the money he earned for a while he gave to his mother, to whom he was singularly devoted. At fourteen he worked as an errand boy, then as a bellboy in a hotel, after that in a cigar store, as an ice-man, expressman, a packer in a dry goods store, and then as a clerk in a retail store. He seldom was able to keep a position more than a brief time on account of his inability to get along with his superiors. At nineteen he seemed to have an opportunity to get a good position and improve his economic position, but he left very soon afterward because he was picked on by one of the men above him. Although he lost positions quickly, he never seemed to have any difficulty in finding jobs. At the age of twenty-one he was married, and his wife died five years later of tuberculosis. Two children were born of this marriage and both died in infancy. His first wife was a poor housekeeper, careless

in her habits, and his home was anything but comfortable or cheerful. Twelve years later he married a second time, no children living from this marriage. As far as one can see this marriage was fairly happy, but all through this period up to the present illness he persisted in his primary traits of incompatibility, dislike for his jobs, inability to fit in with the work that he was undertaking to do.

His present illness, that is, the cardiac part of it, dates back some seven years. It began with shortness of breath on exertion following an attack of influenza. Ever since that time he has been troubled with difficulty in breathing, pain in the region of his heart, difficulty in sleeping, coughing, etc. He has been given more or less digitalis during this whole period. The first note on the heart was "cyanosis, difficulty in breathing, pulse 96, blood-pressure 130/70, frequent extrasystoles, faint heart sounds, no murmurs, precordial pains, enlarged liver, some emphysema." Later notes contain statements of evidence of decompensation, edema over the sacrum, marked respiratory difficulty on slight exertion. Three days later difficulty in respiration, which cleared up under digitalis. x-Rays showed an enlarged heart and cardiogram a right bundle block and myocarditis. Other physical examinations showed no important findings except those associated with a periodic decompensating heart. The neurologic examination was negative. Neurologic consultation asked for in the main because patient became difficult to handle in the wards on account of his antagonistic conduct and his lack of co-operation, sullenness, and refusal to follow ordinary ward routine.

The first neurologic note in regard to this man stated that no positive psychiatric symptoms were present. At that time the patient was rather depressed, anxious, and somewhat apprehensive, but otherwise was normal. A further study, however, showed that abnormal psychiatric symptoms had been present in this patient for many years and had increased very markedly within the past seven years. There had been various episodes of acute psychical alteration in this period, and a steadily developing condition of irritability, sleeplessness, with marked

periods of anxiety, and depression. He would often pace the floor at night complaining of intense cardiac pain and discomfort. Such nights would be followed by depressed states in which he often contemplated suicide. An abortive attempt at suicide by shooting himself through the head was stopped by his wife, who succeeded in taking the gun out of his hands. He began now to think that he was in the way and a burden. During these attacks of depression or anxiety he would shout out, "I am losing my mind, do not touch me, etc." He became difficult to manage in the hospital, developed definite persecutory attitudes toward those about him and those who had been instrumental in sending him to the hospital. He became convinced that he was being starved, that his food was not suitable, etc. He was finally discharged from the hospital because he would not conform to the ordinary ward routine and on account of his antagonistic attitude toward those about him. A week or two later he was brought into the hospital in a state of acute decompensation which improved greatly under small doses of digitalis, but as soon as the symptoms had cleared up he again began to show the abnormal conduct, and his persecutory ideas became so marked that he could not be safely treated in the wards and was sent to the City Hospital. The psychosis in this case was obviously the final development in an abnormal personality. The beginnings of the psychiatric change are to be found in his early life when environmental adaptation was continuously defective. Heart disease was the activating agency, not the essential cause.

Case IV. Depressed State in a Diabetic.—This case illustrates the mental reaction of a diabetic to the disease in terms of a marked depression associated with self-accusations, blame, and suicidal impulses. The development of the psychosis into a definite and chronic depressive state associated with the usual characteristics of such a condition suggests that the diabetes of and by itself did not directly cause this, and that identical symptoms might well be produced by any other morbid condition. There is nothing in its pathogenesis or in the known alterations

of the nervous system which are characteristic enough to cause a definite psychosis depending upon typical changes in the brain. There is no ground for believing that a diabetic psychosis exists. Diabetes is an incidental etiology and the real causes must be looked for in the previous history and in the personality elements of the individual.

This patient is a woman forty-five years old. She comes in the hospital of her own accord, rather against the wish of her husband. Her motive in coming into the hospital is not clear, because she is convinced she has an incurable disease which cannot be benefited by treatment. On December 11th she noticed that she was passing a good deal of urine and that she had to empty her bladder many times during the day and often at night. She immediately consulted a doctor, who after a preliminary examination told her that she had diabetes. She was placed upon a moderately restricted diet and appeared to improve. From the moment she knew that she had this disease two bothersome ideas worried her: one that she had an incurable illness, and the other that she could never manage her diet. These two initial ideas, as will be seen, became more and more fixed until they dominated the whole situation.

The physical examination and the chemical study of this case showed the presence of a mild diabetes, easily controlled by diet with a moderate amount of insulin. She had a mild degree of hypertension, 160/108, which subsequently fell to 148/88. Blood-sugar 163 and 166 mgm. per 100 c.c. of blood, metabolism plus 7. Blood normal in count, leukocyte and differential. Wassermann negative. On a diet of protein 50, fat 150, and carbohydrate 50, with 20 units of insulin, later increase of diet to 65, 200, and 100, with insulin 10 units, she became sugar free. She was otherwise in good physical condition in every way. There was, however, some loss of weight which she did not regain while in the hospital. When she was sugar free her mental condition showed no improvement, rather the psychiatric symptoms tended to become more pronounced in both variety and depth. This tends to prove that the diabetes as such had little to do with either causation or the prolongation of symptoms.

The disease is to be regarded as the provocative stimulus for the lighting up of hitherto dormant mental abnormalities. On entrance the patient was depressed, anxious, apprehensive, and much dissatisfied. It was rather these symptoms and the conduct to which they gave rise rather than the diabetes that presented the chief therapeutic difficulties. A neurologic consultation was asked for on these grounds. Note was made of the evident depression, her extreme anxiety, and constant belief that she was incurable. She presented the picture of a typical depressed individual, sad and cheerless, monotonous in speech, uninterested in environmental happenings, self-centered, and very positive that her interpretation of her condition was correct. The psychical alteration appears to be in relation to the diabetes, as all her remarks were colored by thoughts of this disease. Questions relating to her past life, home conditions, future plans, notions about other things were all answered in a detached fashion. Little information was obtained on account of her indifference. There was some suspicion on her part relating to her husband's attitude to her and her illness. The prime ideas which had become fixed and exercised a controlling influence upon her way of thinking and her manner of acting were concerned with the absolute conviction that she had an incurable condition, that she was in some way to blame for it, and that she could not understand and could not arrange a diet after she left the hospital. On these and related ideas she was incapable of reasoning and understanding. In regard to them she seemed to be confused and unable to explain. She seemed puzzled and distressed. There appeared to be something inevitable in these ideas and she talked about nothing else. At a later examination she was even more depressed, blaming herself, and believing that she had delayed too long in seeking treatment. Other ideas of the same complexion began to attach themselves to these central themes, until practically her whole present existence became tinged with diabetic conceptions of one sort or another. A marked tendency to a doubting and hesitating attitude became apparent. She does not want to stay in the hospital, nor does she want to go home. She wants to give up her diet, but does not see how she

can live without dietetic regulation. She knows that she is sugar free, but does not think that means anything as far as the diabetes is concerned. She is convinced that any one that cannot arrange and understand diet must be crazy, but, on the other hand, insists that she is mentally all right. She does not want to live, but blames everyone for not being able to cure her. She insists that she is well enough to leave the hospital, but is convinced that she has a rapidly fatal illness. This ambivalent attitude makes her unhappy, restless, and dissatisfied. Her appearance and conduct are those of a markedly depressed individual with a good deal of restlessness and some agitation. She is not co-operative and does not fit in well with ward regulations and discipline.

The importance of a social history of a case of this kind is obvious. It seems evident that her experience with this mild attack of diabetes served to crystallize many tendencies in her make-up and many partly developed ideas and notions out of her past. The present psychiatric condition is the consequence of all of this as an organization fitting to the present state of things. The following are some of the pertinent facts obtained from the social service study of this woman: She has an elder sister who has had diabetes for a long time. She has known then more or less about this disease. When the patient was first informed of the nature of her condition she wanted all the information she could get on the subject, she read all that she could lay her hands on, much, no doubt, of doubtful value. She seemed particularly curious about complications. A neighbor of hers who had an amputation of one leg on account of diabetic gangrene told her that she would suffer the same fate, and also said that treatment of any kind was useless. The patient is convinced that this will be her own fate too. She was married at twenty-three, her first husband dying of heart disease about eleven years ago. She had three pregnancies with two miscarriages in her first marriage. Seven years ago she married a second time. Her present husband drinks, and when drunk abuses and accuses her of infidelity. She is suspicious and secretive, hiding from her husband the fact that she has some money of her own derived from selling a

house left to her by her first husband. Her married life has not been happy and there have been many conflicts. The husband is not sympathetic, does not think that she is sick, and objects to her stay in the hospital and to her seeing a physician. She has been moody, distrustful, and suspicious for a long time, and has developed not a few persecutory ideas which are only faintly evident. The present depression appears to mask them.

Case V. Psychosis in the Early Months of Pregnancy.—The pregnant woman often develops psychiatric symptoms in the course of the period between conception and the birth of her child. Some of these symptoms are directly associated with evident abnormalities and are directly concerned with the pathologic aspect of certain pregnancies; others seem to have no pathologic implication as far as the pregnancy is concerned, and, then again, others are mysterious in respect to origin and causes. Inasmuch as the average pregnancy is a normal phenomenon the occurrence of mental symptoms in its course suggests that their causations must lie in the individual deviations of the pregnant woman rather than be due to the pregnancy itself. The following case illustrates the difficulty of explaining the occurrence of such symptoms on the basis of findings or changes present:

On January 16th a nineteen-year-old married woman, four months pregnant, was brought to the Barnes Hospital in a state of profound stupor. This was her first pregnancy. The stupor was interrupted by periods of acute excitement, restlessness, and maniac-like explosions. As she was brought here from a neighboring state she was still under the influence of drugs given her to make the journey possible. Stupor with periods of excitement and a marked tachycardia, as high as 130 to 150, were the outstanding symptoms at the first examination. Gynecologic examination showed an enlarged uterus, large breasts from which milk was expressed, and a normal abdomen otherwise. A diagnosis of early pregnancy was made. She presented symptoms of alternating stupor and excitement. During the latter she was noisy, talkative, gesticulating, and often difficult to control.

Nothing could be made of her talk, as it was disjointed, confused, and disconnected. She did not answer questions and was completely out of touch with surroundings. There is also a rapidly spreading eruption over chest, abdomen, and trunk. An erythema interpreted as the result of the various depressant drugs, such as veronal, luminal, bromids, given before her admission to the hospital. The neurologic examination at entrance was largely negative. Eye-grounds normal, all reflexes present, no paralysis or weakness. Blood showed 3,888,000 reds, leukocytes 7200, hemoglobin 60 per cent. Urine normal, lumbar puncture two cells, normal curve, negative Wassermann. Slightly positive globulin.

Previous immediate history was to the effect that ten days ago she began to vomit. This lasted only a few days. There was no rise in temperature. She was given corpus luteum and glucose. Suddenly, about one week ago, patient became stuporous and excited. She did not recognize anyone and seemed to be hallucinating during the periods of excitement. The day after entrance the left leg became hyperalgetic, and this condition soon spread to the other leg. A bilateral ankle-clonus was found, but no other abnormal reflexes. Stupor, alternating with excited periods, continued, but the patient was not so difficult to manage; average small doses of paraldehyd gave her sufficient sleep and kept her fairly quiet during the day. Blood showed N. P. N. 24.2, Wassermann of both fluid and blood were normal. x-Ray plate of head showed nothing that might be brought into relation with present condition. Heart, lungs, and the other organs were found to be normal. None of the usual pathologic conditions associated with pregnancy could be made out. Temperature normal; there is tachycardia; the skin rash is disappearing; the stuporous periods less marked. Five days after entrance there was a change for the better in her mental state. She began to talk more clearly and recognized people about her. Her voice was high pitched and childish. This was not her natural or at least adult voice. The pulse is slowing down. On the fourth day she asked a few questions, but appeared unconcerned about their answers. She cried

a good deal, but was easily diverted. Though somewhat aware of where she was, she seemed to have no curiosity about herself in her changed surroundings. Speech quality slowly changed to her normal. Occasionally she would hallucinate, but these were only unimportant episodes, mostly in her excited periods. A rather silly set grin was present on her face for a day or two, but this disappeared also. On the 28th she was allowed to get out of bed. She walked rather feebly at first, but there was no paralysis. The ankle-clonus was no longer found. Her recovery from now on was rapid, and she was allowed to go home about two weeks after entering the hospital, apparently perfectly restored to her usual state of mind. When she left there was still a slight tendency to attacks of drowsiness. At the present time, several months after the time that these notes are made, she is perfectly well and her pregnancy is pursuing the usual course. During her stay in the hospital treatment consisted in hot packs, when the excitement became intense paraldehyd for sleep and quiet, occasional lumbar punctures, three in all, and full feeding with as much fluid as patient could take.

There was nothing in her past history or that of her family which seems to bear any relation to this attack. She was a normal girl in every way, the daughter of a successful farmer. She had been married about a year and her marriage was happy. She was eager to have a child, as was her husband. There were no economic worries and no conflicts in her domestic life. Her parents and husband, brother, etc., were available for information about the patient and themselves.

It is easy enough to call this an example of the toxemia of pregnancy. The mental state then could be interpreted as a toxic psychosis, a sort of delirium comparable to the deliria seen in infectious diseases or those produced by poisons or drugs. There are several facts that prevent the acceptance of this idea. In the first place, the absence of fever and leukocytosis and other toxic symptoms and findings. The tachycardia was the only symptom that indicated this, and that can be explained on the score of excitement and motor stimulation. The presence of ankle-clonus and the hyperaesthesia are suggestive of an organic

change of some sort present in the central motor pathway. Though this was a temporary physical finding, it is of some importance. The psychosis may best be described as an acute stuporous condition with maniac-like episodes associated with changes in the nervous system suggestive of definite though temporary irritative process in the cortex, particularly in the motor region. There have been described in the literature cases of what appeared to be chorionic epithelial infarcts from the syncytial buds of the placenta. These locate themselves in various portions of the nervous system, brought here through the vascular system. They set up areas of edema much like any other kind of infarct material, and their temporary nature is the characteristic feature. The chorionic material rapidly disintegrates and the consequence of their presence in the brain as rapidly disappears. If such a thing occurred in this case the explanation seems clear enough. In the absence of any data to support a theory of that kind the present case must be called the result of the toxemia of pregnancy and the mental state as its consequence. The other explanation is much more in line with the clinical as well as the neurologic features, but it lacks confirmation. There are no reliable studies of the pathology found in such cases as far as the central nervous system is concerned. It must be accepted merely as a theoretic possibility in instances of acute mental symptoms in the course of pregnancy with some indications that organic alteration in the brain and central nervous system has taken place.

While these cases show only scattered instances of the psychiatric element in medical and surgical cases, they do suggest both the importance and complexity of the diagnostic problem. In a straight psychosis the examination and study is directed to the mental condition as the presenting clinical picture. In the cases described the mental symptoms are masked by the medical or surgical illness, and when they do appear these characteristics are no longer typical, and sometimes not even suggestive of the underlying mechanism or the causes from which they spring. The chief obstacles in the way of a thorough study of such cases as have been shown, particularly in two of the examples in this

group, is lack of an adequate inquiry into the past history and environment out of which the structural elements of a psychosis so often have their origins. In the absence of a properly prepared psychiatric background the symptoms must be integrated and the picture analyzed as far as they can be. Diagnosis in the best psychiatric tradition is apt to be faulty, but, on the whole, a fair estimate of what the prime disturbance is may be arrived at. A plea might be made for a more or less conscious psychiatric point of view in the study of all cases of surgical or medical instances in which the data of the previous illnesses are even faintly suggestive of psychiatric experiences.

Some answer must be given, in conclusion, to the questions suggested in the introductory paragraphs to this clinic. Psychiatric symptoms should be investigated first of all as arising out of the surgical or medical condition present and as caused by them. In this way delirious states, the most common of all the abnormal mental conditions, may thus have a direct and definite cause. There are not any specific or characteristic mental symptoms associated with definite internal or surgical diseases. Delirium cannot be said to be characteristic. In certain of the psychoses the present illnesses seem to be the activating phase which stimulates psychiatric trends or even dominant symptoms into activity. On the other hand, an old psychosis or, rather, a chronic psychiatric state may be temporarily masked by the presence of some acute surgical or medical illness. Depressive states of all kinds may be due, not to an inherent tendency in the individual, but directly to the patient's more or less logical reaction to the presence of a chronic incurable disease. This is particularly the case when the type of disease is such that the patient is constantly aware of its presence by some tangible display of its activity.

This clinic is given to call attention to the growing importance of the psychiatric point of view in medical and surgical diseases. The evidence that this point of view is being sympathetically received lies in the fact that there is an increasing importance paid to the establishment of neuropsychiatric departments in general hospitals. This is particularly so in those associated with medical teaching.

CLINIC OF DR. WILLIAM ENGELBACH

JEWISH HOSPITAL

INFANTILE DEFECTIVENESS

Significance of the Neglected Field of Mental Deficiency in Infants. Classification. Differentiation of Remediable from Incurable Groups. Percentage of Incidence. Age of Delinquency. Early Diagnosis from Physical Rather Than Mental Manifestations. Defectiveness in the Juvenile and Adolescent Age. Parathyroid and Calcium Deficiency. Pituitary Deficiency, Juvenile and Adult. Other Endocrine Disorders Producing Mental Defectiveness. Relation to Juvenile Delinquency. Prognosis. Treatment.

THE importance of mental defectiveness as a parental and economic question cannot be overestimated in considering its essential relation to the following factors: (1) The growth and development of our children; (2) the standards of our citizenry, and (3) the possible curbing of criminal instincts. The association of mental defectiveness with the criminal personality is being recognized by both the legal and the medical profession. Provision for the proper physical and mental growth and development of the individual to the adult age, where possible, will tend to heighten moral standards and aid in the prevention of crime.

Two groups of mental defectives in infants¹ are to be differentiated for the purpose of accurate prognosis and treatment. They are: (1) the *incurable* and (2) the *remediable*. Among those conditions which should be diagnosed early as incurable are the following: Amentia, moronity, mongolism, microcephalus, mac-

¹ The Mentally Defective Infant and Child, Dr. Borden S. Veeder, Med. Clin. of North America (St. Louis Number), July, 1925, vol. 9, No. 1, p. 57.

rocephalus, hydrocephalus, spastic paralysis, cerebral palsy of childhood, eclamptic or epileptic idiocy, birth palsy, intracranial hemorrhage which has not been opportunely treated, hypertrophic idiocy, amaurotic family idiocy, Little's disease, and progressive muscular atrophy. The remediable conditions consist mainly of (a) *internal secretory disorders* and (b) *congenital lues*. Among the mental and physical deficiencies resulting from

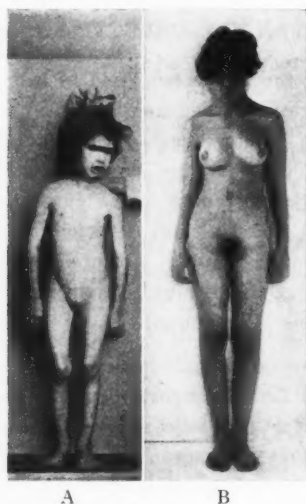


Fig. 35.—Cretin A before and B five years after treatment. Positive chronologic first year's history (overweight at birth, late dentition, walking, and talking). Medical advice was sought at the age of four concerning the mental retardation. Note the definite advancement in osseous development following treatment. The mentality was also improved, but, because of the late exhibition of treatment, not restored to normal.

ductless glandular disorders, (1) those referable to the *thyroid*, namely, cretinism (congenital) and myxedema (adult) are probably of first importance as to frequency of incidence and definitely inhibited mentality. Other glandular disorders exhibiting mental signs are (2) the *pituitary* deficiencies, preadolescent (juvenile adiposity) and postadolescent (Fröhlich's syndrome); (3) the *parathyroid* (and *calcium*) deficiencies, producing

the spasmophilic complexes; (4) *hyperpinealism* (pubertas præcox, or macrogenitosomia); and (5) disorders of the *suprarenal gland*. Hereditary syphilis is associated with a group of defectives who are more or less amenable to treatment provided the nervous system has not become too grossly involved and antiluetic therapy is instituted early and continued for a sufficient time.

Incidence.—A definition of terms is given here indicative of the degree of defectiveness. A simple classification denotes defects of development as *minor* and *major*. A minor defect is defined as a local or general abnormality which has little or no adverse effect upon the individual's progress or attainments. A major defect forms a serious obstacle early in life, and frequently the afflicted is dependent upon the care of members of the family or becomes a public charge. The major defectives often become a menace to society by their lack of moral obligation and legal responsibility.

From a review of surveys of children made by the Departments of Health and Education in Missouri and Indiana the deduction is drawn that 80 per cent. of children have a minor or major defect. Although the great majority of these defects were minor, such as caries of the teeth, adenoids, tonsillar infection, underweight, etc., it is estimated from statistics collected from personal study and through observations made at the Good Samaritan Clinic, Atlanta, Georgia (directed by Dr. Archibald B. Elkin), the Psychiatric Clinic of St. Louis (Dr. William Nelson), and the Psychiatric Clinic of Cincinnati, Ohio (Dr. Louis A. Lurie), that, of all children born, 15 per cent., *one out of seven*, have a major defect, which, if not corrected, renders them a care to family or state. There is rarely a family tree without one major defective, which would be in agreement with the mendelian law. Their frequent occurrence is not suspected, as relatives refrain from exposing their afflictions. It is not difficult to realize, aside from the human sorrow and anxiety, the great cost of maintenance of these major defectives.

Age of Delinquency.—Professor Cooley, of Fordham, making

investigations through the Catholic Charities Probation Bureau in the Court of General Sessions of New York City, reported that (1) 45 per cent. of the inmates of Sing Sing were under twenty-five years of age; (2) of 3053 prisoners investigated in New York City, 62 per cent. were under twenty-five years of age, and (3) 46 per cent. of persons convicted in the courts of record of New York State in 1925 were between the ages of sixteen and twenty-five. This would indicate that at least 50 per cent. of persons convicted for various crimes are below the adult age of twenty-five. As many of these have committed other minor or major offenses before final apprehension, one is appalled at this early age limit. Through the courtesy of former Judge Hartmann, of the Juvenile Court of St. Louis, and Judge Taylor, present incumbent, in conjunction with Dr. William Nelson, Director of the Psychiatric Clinic, it has been our privilege to examine a number of these delinquent boys and girls, in some of whom was discovered a definite endocrine basis. While attending a session of the Juvenile Court the writer witnessed a band of automobile thieves brought before the court for trial consisting of five boys ranging in age from *eight to thirteen*, who had stolen four automobiles, dismantling and selling the parts which could be removed. The records demonstrated that they all had been before the court previously for other offenses. A boy of fifteen was next presented, who was already a confirmed criminal, the records showing that he was a "repeater." He was a gunman, under trial for shooting an unoffending woman.

Diagnosis.—Of prime consideration in states of retarded mentality is the necessity for early diagnosis. In no other condition, such as tuberculosis, malignancy, etc., is a diagnosis in the incipient stage more imperative. It must be emphasized that *the diagnosis of mental aberrancy in children is usually deducible from the physical signs during the first year of life.* Unfortunately, we have endeavored to make a direct or objective diagnosis of mental incompetency without considering other elements in such a state. Helpful hints in the diagnosis of possible defectiveness in a child are often to be obtained from a study of the parents or the family history, such as

elicitation of a hereditary endocrinologic strain and blood tests of the parents for possible lues. A prenatal estimation of embryonal development from a thyroid standpoint is possible through observation of the gravid woman. This would be of tremendous significance in the prevention of abnormal mental development in the infant resulting from thyroid deficiency in the mother, and also of fetal overgrowth, antecedent to a dangerous delivery. Estimations of the basal metabolic rate in gravid women have demonstrated that a certain proportion after the third month of pregnancy have an increased rate, varying from +15 to +25 per cent. In this group of women there are usually a slight transient enlargement of the thyroid during gestation and absence of the signs of intoxication of pregnancy. This increase in the basal metabolic rate is construed as a normal response of the thyroid gland to the gravid state. When this increased rate is present, as far as has been determined, the infant is not overweight at birth and exhibits normal mental and physical development following birth. In instances in which the basal metabolic rate is not increased during pregnancy, there is characteristic an overweight of the fetus and the infant shows a delayed appearance of the osseous nuclei, as demonstrated radiographically, and later a retarded mentality. The clinical examination of the gravid woman should, therefore, embrace more than the physical measurements and urinalysis ordinarily employed by obstetricians. It is probable that investigations for hypothyroidism by means of the basal metabolic test is of tantamount or greater importance.

Case I.—Mrs. H. B. S., Gen. No. 5368, referred by Dr. F. C. Lamar, Kansas City, Mo. Diagnosis: *Hypopituitarism, involving chiefly the anterior pituitary lobe; migraine; pregnancy (four months)*. In addition, the patient gave a history of a sacroiliac subluxation and a recurrent pyelitis, latent at the time of observation. She was referred by her obstetrician chiefly with regard to an internal secretory disorder. Owing to two previous difficult labors, due to increased size of the infant, and the later defectiveness of these children, the patient, as well as her phys-

ician, was reluctant to allow the present pregnancy to proceed in its normal course. Both of these children, aged eleven and twelve respectively, who also underwent medical survey, were mentally and physically retarded. Both had weighed 10 pounds at birth, and the elder gave a history of delayed walking. A combined thyropituitary substitution treatment was recommended for the mother, consisting of desiccated thyroid gland $\frac{1}{2}$ gr. (0.03 gm.) three times a day, by mouth, and antiui-

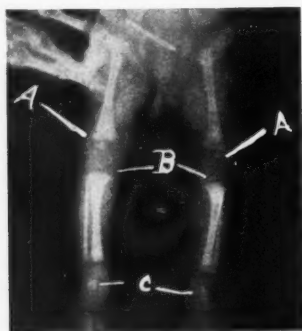


Fig. 36.—Radiograph of a normal infant twelve days after birth (see description of case, Mrs. H. B. S., General Number 5368). The mother previously had given birth to 2 children who had been overweight at birth and had proved to be both mentally and physically retarded. She received combined thyropituitary treatment after the fourth month of this pregnancy. The infant's weight at birth was 7 pounds, 8 ounces. Note the presence of the osseous nuclei of the lower epiphysis of the femur, upper epiphysis of the tibia, and two tarsal bones (talus and calcaneus).

trin 1 c.c. intramuscularly once a week, together with symptomatic treatment for her other conditions, such as the migraine. Her physician continued this medication throughout the remainder of the pregnancy and reported a cesarean section and delivery of a normal infant weighing 7 pounds and 8 ounces, without mishap to baby or mother. The infant had made the normal growth within the subsequent three weeks and was apparently healthy, without determinable glandular defect. Radiograph of the infant taken twelve days after birth showed the osseous nuclei for the age normally developed (Fig. 36).

The writer, in conjunction with Dr. Alphonse McMahon, has compared the osseous growth in glandular affections with the normals at various ages, fetal and infant.¹ We have found that the normal infant at birth has the osseous nuclei of the distal epiphysis of the femur, the proximal epiphysis of the tibia, and two tarsal bones (talus and calcaneus—Fig. 37). A third tarsal center (cuboid) is sometimes present at birth. For

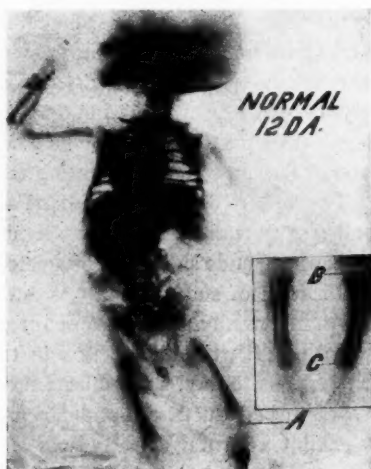


Fig. 37.—Radiogram of a normal infant twelve days old. Note the presence of the osseous nuclei of the distal epiphysis of the femur, proximal epiphysis of the tibia, and talus and calcaneus (as in Fig. 36).

diagnostic purpose, this would require radiograms of the knee and ankle only at this age. A delayed appearance of the additional osseous nuclei which develop during the first year of life could also be detected through the medium of the x-ray. If these radiograms were to be taken of all infants who are overweight at birth or who have physical signs of improper development during the first year, it is probable that many of the cretins and less pronounced thyroid deficiencies could be diagnosed by

¹ Engelbach, William, and McMahon, Alphonse: Osseous Development in Endocrine Disorder, *Endocrinology*, January, 1924, vol. viii, No. 1.

this means. Other conditions which inhibit mental activity in infancy do not influence the osseous nuclear development. This, then, serves as a distinctive sign of thyroid deficiency in childhood. Thyroid treatment, if administered in cretinism during the first year and continued in proper dosage for a prolonged time, is corrective in a certain number of cases. On the contrary, if this treatment is not instituted at this early age, more or less mal-development, both mental and physical, depending upon the degree of thyroid deficiency, becoming less amenable to corrective therapy as the child grows older, will ensue.

A clinical chronologic review of the *physical development* during the first year of life is of great importance with regard to making a diagnosis of possible *mental* defect which may become evident later. The first guide suggesting this state is the *weight at birth*. The weight of a normal infant at birth varies from 6 to 8 pounds. Any child of full term weighing less than 5 pounds or more than 8 pounds should be suspected as a defective. The next indication of such anomaly is a *late separation of the umbilical cord*. Normally separation of the cord occurs at the fifth to the tenth day, without infection of the navel. Its occurrence after the fifteenth day, or an infection of the navel, is attributable to a disturbed ductless glandular function, which later in life may exhibit a mental defectiveness. The *first teeth* (lower central incisors) should appear through the gum at the end of the sixth month, and if eruption has not occurred at seven or eight months, an underlying cause for this delayed dentition should be sought. (See Tables 1 and 2, compiled from various authors, for the normal eruption of deciduous and permanent teeth.) A normal baby should hold up his head without support at the end of the fourth month, and if he does not do so by the end of the sixth month, investigation should be made with regard to a possible remediable cause. An infant of average intelligence begins to take notice and recognize his immediate attendant (mother or nurse) and to grasp objects at about the sixth month. If at the end of the ninth month he does not distinguish between his attendant and strangers, or begin to hold the nursing bottle, an anomaly of

development should be suspected. At the end of nine months he should sit up without support, and if this is not accomplished by the end of the twelfth month, he should be considered a probable defective. The average normal child *begins to walk and to*

TABLE 1

NORMAL ERUPTION OF DECIDUOUS TEETH

	Cent. Incisors	Lat. Incisors	Canines	1st Premol	2nd Premol
Sobotta & McMurich	6-8 mo	8-12 mo	16-20 mo	18-18 mo	20-30 mo
Spalteholz (Fr. Hesse)	"	"	"	"	"
Broomell, Pischel & Rose (Abt's Pediatrics)	"	7-9 mo	17-18 mo	14-15 mo	18-24 mo
Toome (Gray's Anatomy)	6-9 mo (low) 8-10 mo (upp)	8-10 mo (upp) 12-21 mo (low)	16-20 mo	15-21 mo	20-24 mo
Holt (Gray's Anatomy)	Six teeth at 1 yr. Twelve teeth at 1½ yr. Sixteen teeth at 2 yr. Twenty teeth at 2½ yr.				
Cunningham	Eruption begins at 6 mo. All deciduous teeth present at 2 yr.				

talk at one year. At this age he should say dissyllables, or even two or three words together, and walk a distance of 4 or 5 feet without help. Many pediatricians assert that walking in a normal child may not occur until the sixteenth to the eighteenth

TABLE 2

NORMAL ERUPTION OF PERMANENT TEETH

	Cent. Incis.	Lat. Incis.	Canines	First Premol.	Second Premol.	First Molars	Second Molars	Third Molars
Cunningham	Soon after 7th yr	Soon after 8th yr	Soon after 11th yr	Soon after 9th yr	Soon after 10th yr	Soon after 6th yr	Soon after 12th yr	17th-21st (or later)
Sobotta & McMurich	6-9th	7-10th	9-14th	9-13th	10-14th	5-8th	10-14th	18-40th
Spalteholz (Fr. Hesse)	7-9th	8-9th	11-13th	9-11th	11-17th	6-7th	13-15th	17-40th
Broomell, Pischel & Rose (Abt's Pediatrics)	7-8th	7-8th (upp) 8-9th (low)	12-13th	8-11th 10-11th (low)	11-12th	6-7th	12-14th (upp) 12-16th (low)	17-20th (upp) 16-20th (low)

month, but in our opinion careful examination will reveal that these late walkers have some endocrine or other condition to account for their retarded locomotion. The utterance of uncouth, meaningless sounds, such as shrill cries and the drawing of senseless vocalization, and unnatural rhythmic movements, such as continued rocking or swaying, or spasmodic movements

(Fig. 39), during the first year of life are frequently signs of mental disorder. This is true also of crying and screaming without



Fig. 38.—Dental malposition and malocclusion in a congenital hypothyroidism (aged seven).

provocation, and of the baby who is so good that he *never* cries. One or a combination of the above signs should at once make the

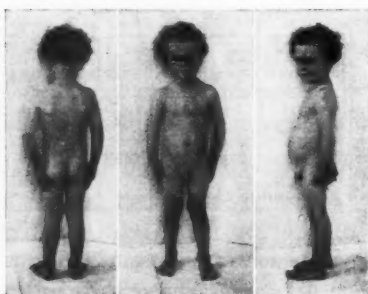


Fig. 39.—Spasmophilia (aged two and one-half years). Diagnosis was made from the spasmodic, purposeless movements, associated with a low blood calcium.

physician and parent skeptical regarding the child's future mental competency. The question arises as to a differentiation of the

various forms of mental defectiveness, any of which might be associated with one, a number, or all of the above symptoms. As previously stated, probably the most positive sign differentiating *congenital hypothyroidism* from other conditions which produce mental retardation is *the delayed ossification as demonstrated by the x-ray* (see Figs. 36, 37).

Not all children who have one or more of these physical signs described terminate as mental defectives. Fortunately, in a certain percentage the infant "outgrows" these inclinations, so to speak, and develops into a healthy child. The point requiring emphasis is that the infant who during the first year exhibits a number of these abnormalities, or even a single marked such manifestation, should receive attention as a suspect potential defective child. Those responsible cannot afford to remain inactive and take for granted the possibility that these apparently minor defects will be overcome, delaying investigation until the second or third year, when the arrested mentality has become unquestioned, but difficult to correct. At this late age (the second or third year) the value of preventive treatment is diminished, as irreparable damage has occurred during the first year of the unfolding of the nervous system. For this reason competent medical examination should be given every infant who has any of the symptoms suggestive of impeded development. Decreased thyroid function, one of the common causes of physical and mental retardation, if diagnosed during the first year may be wholly, or to a large extent, corrected. On the contrary, *if diagnosis is not made until after the third, fourth, or fifth year*, the end-results, both mental and physical, from the same treatment are much less favorable.

Defectiveness in Later Years.—Mental deficiency is often first discovered in the kindergarten. This is probably due to the unbiased judgment of the teacher, who quickly observes the difference in mental activity as compared with the average normal child of the same age, whereas the parents may regard their offspring within the range of variation of normal children. The kindergarten teacher consults the school inspector, whose casual examination fails to demonstrate

any disease of the special senses or of the nervous, cardiovascular, genito-urinary, musculo-osseous or other system. The "backward child" consequently is allowed to finish his year of kindergarten work without further investigation. The following year, when he enters the first year of the graded school, as he cannot keep pace with the class, he is soon relegated to a group of backward students and then to the "opportunity" class. In a short time the parents are obliged to employ special tutoring during both the winter and summer months so that he may be able to accomplish the work in these defective classes. In addition to



Fig. 40.—Tetany (aged twelve). Note the positive Trousseau's phenomenon. This patient had a low blood calcium.

showing impeded progress, these children are often disorderly and intractable, and considered in the incorrigible group both at home and at school.

A characteristic of thyroid deficiency at a later age, even in those instances in which the function of this gland is only partially affected, is the *early maturity*. In this altitude the normal adolescent age in the female is from thirteen to fifteen years. The girl with thyroid deficiency usually attains adolescence a year or two before this age, or earlier, in the cretin type.

Parathyroid Deficiency.—When the parathyroid glands do not functionate sufficiently in the earlier years of life, the child manifests extreme nervousness and irritability and is subject to various muscular spasms, or *spasmophilia*. Such spasms in the laryngeal muscles cause choking spells and a croupy cough, an affection known as *laryngismus stridulus*. In *infantile tetany* the extremities particularly are affected. These spasms may occur at the slightest provocation. A slight indigestion or diarrhea, which may be accompanied by a temperature of 102° to 104° F.,



Fig. 41.—Postoperative tetany following thyroidectomy. In dissecting a specimen of the thyroid removed at operation the parathyroid glands had not been found, for which reason it is probable that the transient parathyroid insufficiency was due to a temporary circulatory disturbance of these glands. This patient was referred as a suspect epilepsy. She had a low blood calcium, a positive Trousseau's phenomenon, and other signs of tetany.

will induce a "spasm" in this type of child, whereas a similar toxemia and fever in other children is *not* associated with convulsions. This secretion from the parathyroid granules, as is known, helps to regulate the calcium metabolism. When from any cause the blood calcium content is reduced below the normal (9–11 mg. per 100 c.c. of blood-serum), these muscular spasms are liable to occur. Calcium has long been administered with good effect in muscular twitchings, convulsions,

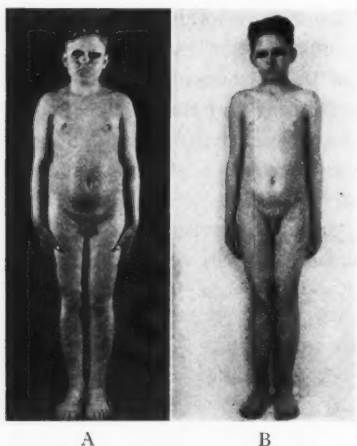


Fig. 42.—Bilobar hypopituitarism: A, Before and B, eleven months after treatment. Note the change in adiposity, physiognomy, etc. Treatment was instituted at the age of twelve.

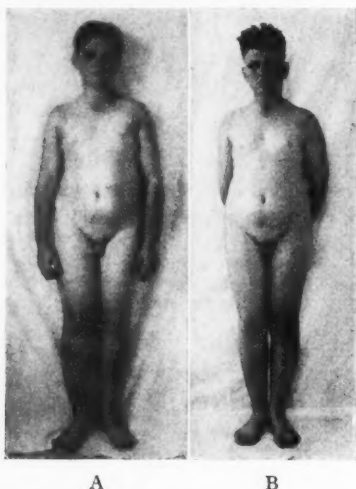


Fig. 43.—Bilobar hypopituitarism, aged twelve: A, Before and B, after nine months' treatment. Note the redistribution of adiposity, change of expression, etc.

or contractures in infancy. Calcium given intravenously is more efficacious than by mouth. Parathyroid extract, a potent preparation of which is on the market, given hypodermically, augments this effect of calcium.

Defectiveness Due to Pituitary Insufficiency.—A more common endocrine disorder than the deficiency of the parathyroid glands is that produced by a decreased secretion of the *pituitary gland*, or hypophysis cerebri (Figs. 42-44). When the posterior



Fig. 44.—Bilobar hypopituitarism, aged fourteen: A, Before and B, after ten months' treatment. Note the changes in adiposity, genital development, pubic hair growth, physiognomy, etc.

lobe of this gland in the earlier years of life fails to supply the system with a sufficient amount of its specific hormone, the youngster becomes obese, a state we have termed *juvenile adiposity*. This juvenile pituitary adiposity differs in age incidence from early thyroid overweight, inasmuch as it rarely appears before the fifth or sixth year, whereas thyroid adiposity is present at birth and is usually absent after the first or second year,

unless a pituitary disorder is engrafted upon a congenital hypothyroidism. The pituitary adiposity so often seen in children is so outspoken that it requires no comparison with the standard weight for the height and age. It is not, as a rule, considered significant by parents or family physician, as these children apparently are healthy in every other respect. They have no mental retardation at this time, but, on the contrary, frequently are mentally precocious during the juvenile age. The laity, as well as the medical profession, have emphasized more the opposite state of *underweight*, or malnutrition, as one demanding surveillance and, if uncorrected, leading to serious outcome. Observation of a large series of cases confirms statistical surveys on children; *i. e.*, the *percentage of incidence of overweight exceeds that of underweight*. The annual report of the Division of Infant and Child Hygiene, State Board of Health of Indiana (for the year ending September 30, 1923), reveals that, of 12,692 children examined, *27 per cent. were found to be overweight, while only 16 per cent. were underweight*. Furthermore, the *future development* of the child who is overweight in most instances will prove to be more problematic than the child of underweight. This gross objective sign of adiposity should be a danger signal, not as to the immediate status of the child, but with regard to the proper adjustment and relationships of the individual following adolescence. Before adolescence these children have relatively few complaints, progress through school normally, and are fairly active and alert. The latent danger lies in their failure to develop normally during the adolescent period. Improper development in the transition from boyhood to manhood, or from girlhood to womanhood, produces secondary psychic and nervous reactions which influence the advancement, projection, and accomplishment of the individual in later life. For this reason, early attempt should be made, through competent medical guidance, to correct this state of glandular deficiency before adolescence, and thus the later complications in persons of both sexes having this endocrine disorder might be prevented.

Defectiveness Due to Other Endocrine Disorders.—The anomalous condition which is thought to attend abnormal func-

tion or secretion of the *pineal gland* (pubertas præcox, or macrogenitosomia) consists in a precocious development of the entire body, including the generative organs, in infancy or childhood, before the age of maturity. Another endocrine disorder (probably *suprarenal* in origin) is accompanied by an increased hair growth on face and body. A tendency to facial hair growth in childhood or in the female, a precocious bodily development, or an early appearance of primary and secondary sex characters, in some instances many years before the normal age of maturity, is suggestive of disorder of the cortical portion of the suprarenal gland. Nearly all persons having this extraordinary or precocious development (pubertas præcox, suprarenal cortex disorder) have mental symptoms sooner or later. These vary from a slight or definite mental inhibition to an intensive precocity of mind, as in the child prodigies. They in some instances have associated focal or general nervous disease, such as spasms, epileptiform contractures, or epilepsy. In some suprarenal cortex disorders the constitutional response corresponding to the sex type is absent. These show a tendency to the opposite sex type, the "effeminate male," or the "masculine female," and often progress to a "shut in" complex, desiring to isolate themselves from association with others.

To reiterate, an important consideration in this subject of the "backward child," aside from the individual and public health, is the ultimate effect upon the standards of citizenry. Observations made by organizations which are dealing with the delinquent boy and girl (St. Louis, Cincinnati, and Atlanta) would seem to justify the assertion that over 50 per cent. of these "out of focus" children who are a puzzle and a pest to parent and teacher have a definite mental defect. The consensus of opinion of jurists, penologists, psychologists, and psychiatrists who are more interested in *prevention* than in *punishment* of crime, is that a certain percentage of these "budding bandits" are not necessarily headed for jail, provided a timely study of their problems and difficulties be made by competent medical authority. In its economic phase this subject affects the community and state as a whole, as immense sums are expended in the protection

of the commonwealth against the criminally inclined and in the trial and punishment of offenders. Thus preventive treatment directed toward early defectiveness assumes a wider significance than family relationship and individual conduct, extending its influence to the public welfare and to posterity.

Variegated clinical syndromes are presented in disorders of one or more of the endocrine, or ductless, glands. The object of this discussion, however, is merely to indicate some of the significant early signs presented in ductless glandular affections which, in many instances, are remediable provided treatment is instituted in the initial stage. All of these conditions demand the earliest scrutinizing attention of the family physician, who in the majority of cases will be able to diagnose the disorder and institute treatment which, in a large percentage of the remediable group of defectives, will prevent serious end-results.

CLINIC OF DR. HARRY L. ALEXANDER

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LOCALIZED ALLERGY

THE term "allergy" has become indiscriminate, and is used here to refer to the process designated variously as human hypersensitiveness, protein sensitization, and atopy. In this sense, allergy bears a close relationship to anaphylaxis in animals. Here, it is well to recall that not only are certain animals more reactive to anaphylactic shock than others, but that in various species anaphylactic death is the result of the behavior of different tissues. Thus, in the guinea-pig, the bronchi particularly are responsive to the reinjected antigen, and asphyxia results from bronchospasm. In the rabbit, the bronchi are unresponsive and death occurs from arteriospasm of pulmonary vessels. The dog, on the other hand, responds characteristically to neither of these effects, but suffers from an abnormal hepatic reaction.

In man, allergy expresses itself by two lesions, edema and smooth muscle spasm. The organs affected principally, insofar as they may be recognized, are those of the upper and lower respiratory tracts, the skin, and the gastro-intestinal tract. The vascular system and possibly other organs may be involved under particular circumstances. When an allergic individual comes in contact in the usual way, through inhalation or ingestion, with the substance to which he is hypersensitive, an edema or smooth muscle spasm in one or more of the above organs is initiated. These lesions define certain symptom complexes. Thus, hay-fever or vasomotor rhinitis is an edema primarily of the nasal mucosa; bronchial asthma, an edema and smooth muscle spasm of the bronchi; urticaria and eczema edematous processes in the

skin; and vomiting and abdominal cramps following the ingestion of intolerable foods, are edemas and smooth muscle spasms of certain portions of the gastro-intestinal tract. These are the more important clinical manifestations of allergy.

It seems singular that the respiratory and gastro-intestinal tracts and the skin are the only organs that are recognized to manifest commonly the allergic reaction. This implies that the receptive agents to the offending allergens reside particularly in these tissues. More strange, however, is the obvious fact that, when contact is made with allergens, only certain of these tissues react. For instance, an individual who is sensitive to the allergens of wheat may develop bronchial asthma but no other symptoms after eating this food-stuff. Apparently, wheat, or its digestive derivatives, is absorbed from the bowel and eventually enters the circulating blood in some offending form. The receptive cells of the bronchi react by mucosal edema and smooth muscle spasm, although the local process includes many other subsidiary changes. No appreciable change, however, may occur in the skin or gastro-intestinal tract, or even in the upper portion of the respiratory tract.

A similar differential selection occurs in most cases of hay-fever. Only in the minority of cases does a complicating bronchial asthma develop, although both portions of the respiratory tract must be exposed to the extremely minute amount of pollens required to initiate allergic reactions in hypersensitive individuals. This point again is emphasized in those cases where multiple lesions do occur. Thus, the ingestion of strawberries in a hypersensitive individual may lead to abdominal cramps and urticaria, but not necessarily to asthma and vasomotor rhinitis. In all probability, however, all organs which participate in allergic reactions are more or less sensitive, and the demonstration of symptoms depends probably on the degree of sensitivity. This may be deduced from the fact that when a general reaction occurs from a parental injection of an offending allergen, symptoms referable to the respiratory and gastro-intestinal tracts and the skin may also occur simultaneously, even though the previous symptoms were referable to one of these systems only.

As will be seen, these remarks introduce a most important consideration—the reactivity of the skin. It is upon the demonstration of skin reactions that so much of the diagnosis and treatment of allergic manifestations is based. Eczema, urticaria, and angioneurotic edema are the usual skin lesions considered allergic in origin. Their appearance in hypersensitive individuals indicates that the offending foreign substance was transported to the skin via the blood-stream, for rarely does local application cause these lesions excepting through broken skin. The skin test is based upon the principle that if the cutaneous cells are receptive to a particular allergen placed in contact with them, a visible reaction will occur. This implies that the subject is hypersensitive.

There is an impression, far too common, that since a positive skin reaction indicates a condition of hypersensitiveness, then the converse is true. The failure to obtain positive skin reactions in cases of suspected allergy, or even of known allergy, has led to much discredit of the skin test as a diagnostic procedure. If one would appreciate that in a given individual certain organs only, as a rule, are receptive to allergens, and that unless the skin be so, no reaction can occur, he would become reconciled to the failures of skin testing.

It so happens, fortunately, that the skin will react in about 50 per cent. of allergic patients. The age of the individual, the method of acquiring the foreign substance, and the nature of it, all influence the incidence of reactions. Thus, children react more surely than adults, inhalants give more reactions in adults than do foods, and pollens are associated more often with skin reactions than other groups of allergens. It is interesting also, that apparently the cells of the superficial skin layers may react differently from those of the deeper cells. For instance, in urticaria a skin reaction is infrequent, even at times when food that causes the condition is known. Examples of the selective action of certain cells to allergens now will be demonstrated.

Case I.—This patient is a carpenter, thirty-two years of age. His chief complaints are a watery nasal discharge, nasal stuffi-

ness, and itching of the conjunctivæ and pharynx. These symptoms, typical of hay-fever, begin annually about the first or second week in August and persist until the first frost comes. There are no complicating symptoms. His physical examination is essentially negative at this time. On intradermal testing to specific allergens, large reactions to both giant and short ragweed are demonstrated. This case is typical of autumnal hay-fever. Pollens to which he is sensitive are inhaled and cause receptive cells of the upper respiratory tract to react with edema. The bronchi, which doubtlessly receive some pollens, are unresponsive. The skin, on the other hand, is found sensitive, which is the rule in hay-fever.

This patient demonstrates, then, a local sensitivity of the upper respiratory tract and epidermis, but none in the lower respiratory tract.

Case II.—This woman is twenty-nine years old and her complaints are quite similar to those of the patient just presented, excepting that, at the height of the hay-fever symptoms, typical asthmatic paroxysms occur occasionally. On testing her to a variety of pollens which are prevalent during the time of her symptoms, it is seen that no positive skin reactions are elicited. This is unusual. Her inflamed eye, however, represents a positive ophthalmic reaction resulting from the installation of a drop of dilute ragweed pollen solution in the conjunctiva.

In this patient, in contrast to the one just seen, there is evidently a sensitivity of the respiratory tract, but none of the skin.

Case III.—This child is eight years old. She has been treated for persistent bronchial asthma for the past year by various physicians, two of whom did skin tests with a large number of foreign substances. No positive reaction was elicited. Tests to the common allergens by the intradermal method were done here recently and all were negative. Inasmuch as asthma paroxysms occurred almost constantly, and in the absence of bronchial infection, it was believed that there was a fairly constant contact with some offending substance. After some dietary

manipulation, with the exclusion of various foods commonly partaken, it was found that wheat ingestion was followed consistently by asthma. On a diet free from wheat, there have been no attacks excepting on one occasion when, inadvertently, cake was eaten.

Here again is a demonstration of localized allergic disturbance. No cells, other than those of the bronchi, were recognized to react after wheat ingestion, although cells everywhere were exposed to the exciting agent in the circulating blood.

Case IV.—This patient is thirty-nine years of age. Her complaints, among others, are abdominal pain and blue spots on the skin. Her mother had asthma and the patient gives a history of attacks of hives. A few weeks previous to admission to the hospital she noted blue spots on her legs. Their onset soon was followed by cramping abdominal pains which did not localize. These have persisted. The essential physical findings are an apparent anemia, a few definitely purpuric spots on the legs, and a moderately distended tympanitic abdomen. The urine shows evidence of a hemorrhagic nephritis, and there is blood in the stools. Blood studies are normal excepting a moderate anemia.

The bleeding into the skin and mucous membranes, associated with abdominal cramps and complicated by a hemorrhagic nephritis, led to a diagnosis of Henoch's purpura. The distinct family history of asthma and the past history of urticaria in this patient pointed to a possible underlying allergic mechanism. This was all the more suggestive inasmuch as a recent patient with food allergy due to wheat, exhibited similar abdominal symptoms and urticaria. Skin tests to a variety of allergens, particularly foods, were made, but no reaction was obtained. Various articles of diet were excluded, and it was discovered that the patient improved when milk was eliminated. On giving milk, it was observed repeatedly that the abdominal pains could be re-elicited. Radiographic pictures of barium enemas taken before milk ingestion, and when free from pain, and again when pain occurred a few hours after taking milk, showed a relaxed and a hyperspastic colon respectively. The latter condition was re-

lieved by adrenalin. This case with others is reported elsewhere.¹ This patient is shown here to demonstrate that milk apparently was responsible for the gastro-intestinal pain which appeared after its use. Moreover, since in food allergy with cutaneous lesions the allergenic substance enters the blood-stream, it is quite probable that in this instance it reacted on capillaries of the skin and mucous membranes, giving rise to purpura, as well as on the smooth muscle of the colon.

These cases demonstrate the fallacy of expecting a positive skin reaction in all disturbances apparently allergic in origin, for, unless the epidermal cells are sufficiently sensitive, they cannot react to allergens applied to them. In view of this fact, other diagnostic measures should be used. There are two important ones. One is the ophthalmic test, or better, the application of a dilute solution of the suspected allergen to the mucous membranes of the nose which will often give a local edema in the absence of a skin reaction. The other test is dietary manipulation wherein the incrimination of particular food-stuffs is sought. This may be done by eliminating foods commonly taken such as milk, wheat, egg, and potato; or even by starving the patient for a day or two. If the symptoms diminish under this régime, one article of food is given every forty-eight or seventy-two hours until symptoms reappear. The test is checked and rechecked by giving the suspected food deliberately and observing its influence on symptoms.

These methods again call attention to the localization of allergic reactions, a fact that is obvious but not sufficiently emphasized.

¹ Alexander, H. L., and Eyerman, C. H.: Food Allergy and Henoch's Purpura, *Arch. Dermat.*, to be published.

CLINIC OF DR. HORACE W. SOPER

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TREATMENT OF PEPTIC ULCER

I HAVE used the term "Peptic" ulcer inasmuch as I wish to include the consideration of gastric, duodenal, and jejunal ulcer. We have not made much progress in the dietetic treatment of ulcer since the time of Cruveilhier, who first recommended milk as the ideal food in ulcer cases. The Leube-Ziemssen method consisted in frequent feedings of small quantities of milk coincident with strict rest in bed. Lenhartz noted the loss in weight and anemia which followed the Leube cure and advocated a higher calorie diet consisting chiefly of raw eggs and chopped raw meat. Bismuth and belladonna were the most popular remedies about this period (1900). Sippy modified the Leube cure by giving large doses of alkalies and lavaging the stomach once daily. His dictum was to keep the stomach free from acid. Smithies consistently combatted the Sippy treatment and pointed out the unsatisfactory results and its lack of sound physiologic basis. Shattuck and others demonstrated the real dangers of administering large doses of alkalies over a long period of time. A condition of alkalosis resulted in many patients, particularly those with damaged kidneys. Alvarez recently detailed his method of treatment, omitting alkalies altogether and permitting the patient to be up and about. Einhorn was the first to advocate and use duodenal tube feedings in ulcer cases. Each modern author appears to have his own pet notions about the dietetic management of ulcer patients.

The surgical treatment of ulcer for a time almost supplanted the medical or dietetic method. The gastric surgeon was wont

to exclaim triumphantly, "Three weeks after the operation and he now eats everything." After the lapse of time, however, complications such as hemorrhage and jejunal ulcer followed the surgical procedure. At the present time nearly all the surgical clinics are careful to give definite dietetic instructions following the operation.

The chief objection to the ulcer cure régime is that the patient confidently expects to be able to eat everything after he has passed through the ordeal. This mental attitude is emphasized following surgical procedure. The idea is beginning to dawn that the ulcer patient must be a careful eater the remainder of his sojourn on this planet.

For the past twenty years I have insisted upon a follow-up method in my ulcer cases and have been gratified by the long list of good results that was obtained. I attempted to base my dietary on sound physiologic laws, at the same time I noted the foods that seemed to produce relapses and empirically omitted offending articles from the diet lists. For example, tomatoes, raw fruits, raw vegetables, and meat soups are prohibited. Orange juice is permitted many months after all subjective symptoms have disappeared. This statement may appear dogmatic, but there exists strong evidence against some of the foods interdicted besides those based on empiricism. Meat extractives (soups) stimulate gastric secretion of HCl. Raw vegetables are likely to contain infectious elements, are usually not well masticated, and thus are apt to act as traumatic elements. No one will deny that infection plus trauma is a probable factor in the production of gastric and duodenal ulcer.

Having now given good and sufficient reason for dogmatism on this subject I shall proceed to briefly outline my method of treatment.

SIMPLE UNCOMPLICATED DUODENAL AND GASTRIC ULCER

(The patient is well-nourished, shows no weight loss. The guaiac test is negative for occult blood.)

The patient is instructed to abstain from vigorous exercise, but may be up and about and attend to his regular business pro-

vided he takes his feedings on schedule time. A powder consisting of equal parts of light and heavy calcined magnesia is given in one glass of water upon arising, just sufficient to cause one daily colonic evacuation. Each ulcer diet list contains a warning not to take aspirin or similar drugs for colds or headaches, because we noted many relapses followed the ingestion of drugs of the salicylate class. He is requested to report to the office each week (if non-resident by letter).

DIET LIST NO. 1 FOR FIRST TEN TO FIFTEEN DAYS¹

1. Cream of wheat (thoroughly cooked) with cream and little sugar.
 2. Farina (thoroughly cooked) with cream and little sugar.
 3. A raw egg beaten up in one-half glass of milk and cream. This may be flavored with a little sugar, not more than a level teaspoonful. You may also add 2 drops of vanilla flavoring extract.
 4. One glass of half milk and half cream.
 5. Custard, must be fresh and well baked or boiled.
 6. Cornstarch pudding made according to formula on package.
 7. Junket. You may get the junket tablets at any druggist or grocery and have it prepared according to the formula on the package.
- You must eat regularly every two hours, selecting anyone of the above foods for a feeding.
- If you awake at night you must have a glass of half milk and half cream handy at the bedside and take it.
- You must drink one glass of cool water upon arising and drink it during the day if thirsty.

DIET LIST NO. 2 FOR TWO WEEKS

Same as List No. 1 with the following additions:

Uneda biscuits or white bread broken up in milk and cream. (Bread must not be too fresh.)

Creamed vegetable soups, made according to following formula:

Use any vegetable except tomato. The vegetable must be thoroughly boiled with the addition of a little baking soda to help soften it. While still hot the vegetable must be pressed through a sieve or colander with meshes fine enough to remove all the fiber. Milk, flour, and butter are gradually stirred into the vegetable pulp over a slow fire until the whole mass is perfectly smooth and free from lumps. Add very little salt and serve while warm, but not too hot.

¹ Unless milk has been properly pasteurized home pasteurization is advised.

DIET LIST NO. 3 FOR TWO TO FOUR WEEKS DEPENDING UPON THE REACTION OF THE INDIVIDUAL PATIENT

Same as List No. 2 with the following additions:

Fresh cottage cheese. It is necessary to have the cheese beaten up well with cream and strained. Do not eat it if it is sour or lumpy.

Toast made from white bread with salt-free butter.

Honey. Do not eat the comb.

Soft vanilla or chocolate ice-cream and light sponge or sunshine cake.

DIET LIST NO. 4. FOR FOUR WEEKS

Breakfast: Thoroughly cooked cream of wheat, farina or cornflakes with cream and little sugar.

Eggs (seven minutes). Drop 2 eggs with the shells on into 1 quart of boiling water and set off the fire at once. Keep the vessel covered and allow the eggs to remain for seven minutes.

Milk toast (made from stale white bread) and unsalted butter.

One cup hot water and cream (one-third cream).

11 A. M.: One glass half milk and half cream.

Lunch: Eggs (seven minutes).

Tender roast breast of turkey, chicken, or squab (without dressing). Scraped beef mixed with the white of an egg and broiled.

Envelop steak (scrape beef) (leave out all fibers). Put in envelope. Seal up. Add fresh butter to very hot skillet and drop the envelop in it, turning it from time to time, until it is well done. Add a little fresh butter and salt and serve.

Fresh fish baked. (Avoid skin and sauces.)

Rice well cooked. Potatoes well mashed.

Thin dry toast and unsalted butter.

Milk toast and unsalted butter.

Custards, gelatins, cornstarches, tapioca, junket, blanc-mange; all made with little sugar.

One cup hot water and cream (one-third cream) or half milk and half cream.

4-5 P. M.: Same as at 11 A. M.

Dinner: Same as at lunch.

No soups or gravies. All food must be very well cooked.

Use butter and cream freely.

Avoid all condiments, such as mustard, horse radish, catsup, etc.

Use very little sugar, very little salt, no pepper.

Drink cool water (slowly) as often as desired.

After this time additions are gradually made until at the end of about four to six months the following general rational diet for the ulcer patient is reached:

Meats, all kinds, broiled, roasted, and stewed must be well done.

(Young chicken and small fish may be fried in butter.)

All well-cooked vegetables.

All well-cooked fruit.
Fruit jellies.
All kinds of bread.
Milk, eggs, and butter.
All kinds of light desserts.
Avoid rich pastries.
Orange juice permitted if no symptoms follow its use.

When this list has been reached the powder in A. M. is discontinued. If constipation is present, restoration of colonic function is secured by appropriate treatment.

Of course a certain percentage of cases in this class do not follow the ultimate diet list and a few do not suffer relapses, but recurrence is the rule in a large number of them. The majority finally learn the lesson after repeated relapses and stick to the diet. Selection of food is largely a habit and most patients adjust themselves without further craving for raw foods.

The above rules are to be followed in the postoperative patients. We have noted about the same percentage of relapses in the patients in whom surgery has been employed. We do not administer alkalis except in the more severe type of ulcer. It is withdrawn as soon as possible. If the pain persists the diet is incorrect, or the case is not suitable for dietetic treatment and surgery is indicated.

HEMORRHAGE FROM ULCER

Absolute bed rest, ice-bag to epigastrium, gelatin water by mouth, approximately 1 to 2 ounces every half-hour, enema 4 ounces 3 per cent. glucose every three hours. N. B. No irrigations of colon, laxatives, or laxative enemas are to be given. If no bowel evacuation occurs for one week so much the better. At the end of one week Boas oil emulsion enema is given. On the third day 2 ounces of milk alternating with white of one egg every hour. The gelatin water is continued in quantities sufficient to control thirst. Morphia is used initially and thereafter to control restlessness. Fibrogen hypodermically, one ampoule every three hours until four to six ampoules are given. Blood transfusion is always useful and should always be given in the severe hemorrhage that is followed by shock.

Many ulcer patients have small frequent unrecognized hemorrhages and suffer from secondary anemia. The diagnosis is made by systematic guaiac tests of the feces for occult blood. This type of ulcer should never be treated by the ambulant method, but bed rest must be absolute and the diet as outlined above.

Patients who have severe almost constant pain, and in whom physical examination reveals involuntary rigidity of the upper right rectus muscle, should also receive prompt bed rest and strict dietetic régime as above outlined. This is the so-called "pin-point perforation" type of ulcer.

There remains a class of patients who do not respond to the above methods of treatment. Some individuals do not bear milk well. The Coleman diet may be very useful in such cases. Briefly, it consists in feeding 1 ounce of butter or olive oil every hour until 1 P. M. Thereafter, the white of one egg is given every hour until 7 P. M. Three per cent. solution of glucose is given by proctoclysis. Instead of the continuous drop method, 4 ounces every three hours is to be recommended. No feedings are given during the night. Bed rest, no medication excepting that I give small doses of morphia at night if restless.

Ulcer in the pyloric ring usually demands surgical interference. All old chronic ulcers are best handled surgically. Surgery is indicated in the ulcer that produces fibrous pyloric stenosis. Perforation in ulcer demands immediate operation.

JEJUNAL ULCER

The ulcer following gastro-enterostomy may usually be traced to errors in diet. One of our patients ate freely of pickles two months after the operation. Acute obstruction resulted. Gastric lavage removed a large bowl full of fragments of pickle, too large to pass out of the stoma. Jejunal ulcer followed. Operation was performed, and the patient succumbed. A second patient, four weeks after gastro-enterostomy, ate freely of asparagus. He ate it daily for a week and finally had a vomiting attack. Lavage removed a large handful of the vegetable fiber which had accumulated in the stomach. Jejunal ulcer resulted

which finally healed after a long course of treatment. Jejunal ulcer rarely heals by dietetic methods. Surgery is the method of choice.

In three of our cases the Levin duodenal catheter intranasally have given very good results. The catheter (14-16 F.) must be long enough to pass by the gastro-intestinal stoma. It leaves the stomach via the pylorus.

I wish to mention in some detail the history of a jejunal ulcer case recently treated.



Fig. 45.—January 16, 1926. Characteristic deformity indicative of jejunal ulcer.

Mrs. M., age forty. She was operated upon in October, 1925 for duodenal ulcer. Gastro-enterostomy. She was given the usual directions regarding diet by the clinic where the operation was performed. She was fond of salads and ate freely of lettuce and tomatoes. Some four months after the operation she returned to the clinic where a diagnosis of jejunal ulcer was made, and surgery strongly advised. She refused and was referred to me in January, 1926. She had considerable food retention, and

the Roentgen Ray disclosed characteristic jejunal ulcer picture (Fig. 45). Small masses of blood was a constant finding in the stomach contents. I advised surgery, but could not secure consent. We finally decided to try the Levin duodenal catheter treatment. The tube reached about 12 inches below the stoma (Fig. 46). We were able to demonstrate by means of a second tube that no regurgitation of the ingested food occurred in the stomach.

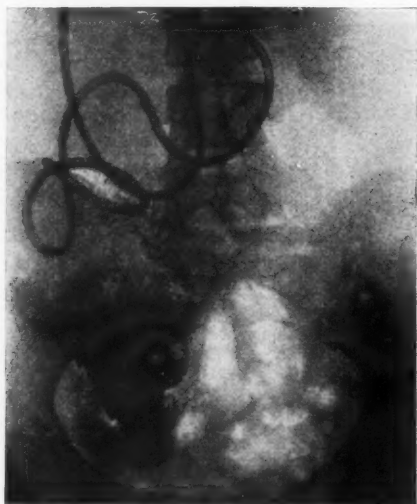


Fig. 46.—January 26, 1926. Barium mixture was injected through the duodenal catheter *in situ*.

She was extremely restless and difficult to manage. Fortunately $\frac{1}{8}$ grain morphia given by mouth every three hours was well borne, and controlled the nervousness, making it possible for her to sleep and retain the tube comfortably. Egg albumin was given by mouth in order to control the dryness of the mouth and pharynx which she experienced. The feeding via the catheter consisted of the usual emulsion of milk, eggs, and lactose. The oil emulsion enema regulated colonic function. At the end of

three weeks the tube was withdrawn and she was allowed to sit up. The morphia was discontinued at once without difficulty. She was fed carefully as above outlined. Six weeks later (March 8, 1926) x-ray disclosed that the stoma had closed, all the food passing out via the pylorus (Fig. 47). Motility good. Four months after (July, 1926) the third x-ray revealed the stoma had



Fig. 47.—March 8, 1926. Gastro-enterostomy stoma closed.

reopened, the major portion of the barium meal passing out into the jejunum (Fig. 48). She has been free from pain and discomfort. Is now on the general rational diet as above described. A letter received March 15, 1927 states that she is free from all stomach discomfort, adheres to her dietetic instructions, and has regained her normal weight and strength.

In conclusion I would emphasize:

First: That simple uncomplicated duodenal and gastric ulcer will heal in the large majority of cases by the ambulant dietetic method without the administration of alkalies.

Second: Certain dietetic restrictions are necessary after the ulcer has healed whether treated by dietetic method or surgical procedure.



Fig. 48.—July 16, 1926. Showing normal filling of the jejunum. Contrast with the ragged appearance of Fig. 45.

Third: Jejunal ulcer is produced by dietetic errors following the operation of gastro-enterostomy. Some of the cases are amenable to treatment by means of bed rest and the employment of the Levin duodenal catheter.

Fourth: Operation should not be performed in the stage of hemorrhage.

CLINIC OF DR. BORDEN S. VEEDER

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THE SYSTEMIC MANIFESTATIONS OF UPPER RESPIRATORY INFECTIONS

INFECTIONS of the upper respiratory tract make up a large part of the diseases which the pediatricist is called upon to treat. Not only in this type of infection do we have definite local symptoms of inflammation of the nose, nasal sinuses, throat, tonsils, and pharynx, but it is most important to realize that both acute and chronic infections of the upper respiratory tract are associated with disease or pathologic changes or symptoms of disease in many other parts of the body. Certain forms of this association are so well recognized that they scarcely need comment, but in many instances this association or relationship is either not recognized or is seemingly unknown, and hence treatment is misdirected. As an example of this I might cite the case of N. S., a little girl of six years. At about the age of two and one-half years she started to have periodical attacks of abdominal pain, nausea, and vomiting, lasting over a period of three to five days, which came on at intervals of from four to six weeks. This had been diagnosed as acidosis—always a symptom and not a disease *per se*—and for a period of three and a half years she had been treated with all sorts of tonics, and drugs and diets innumerable. She was 'subject to colds.' One of the striking features was the recurrence of mild attacks of pain centering about the umbilicus. The child when I first saw her was badly undernourished, and considerably below average weight for her height. The muscles lacked tone and the child showed enlarged cervical lymph-nodes, ragged infected tonsils, and some adenoid hypertrophy. The

child was brought with a request for a diet which would prevent the recurring attacks of acidosis which were keeping her physically unfit. It was explained that the gastro-intestinal symptoms were undoubtedly toxic in origin and that the nasopharynx was seemingly the source of the toxemia. Further that a diet would not do any good until the source of the poisoning was removed. The tonsils and adenoids were removed. At once the child started to improve and now for a period of two years there has not been an attack. No diet was ever prescribed, except the ordinary diet for a child of six years. In the two years the child has gained some 20 pounds, and is the picture of health, and as robust as the most exacting parent could desire. This case is an excellent illustration of chronic toxemia having its origin in a subchronic recurrent infection of the upper respiratory tract, producing nearly all of the symptoms of toxemia in the gastro-intestinal tract. It illustrates very well the general principle of remote systemic effects of upper respiratory infection. From this point the discussion can be carried on in a more systematic manner.

Acute Infections.—There is no specific type of bacterial infection producing the acute upper respiratory inflammations. One of the most striking things about these infections is their tendency to run through a community in epidemic or wave form, and for these different epidemics to show certain selective tendencies or peculiarities in their manifestations. Thus during one epidemic the association of nausea and vomiting will be striking, while in another a tendency for extension to the middle ear will be the outstanding feature. Seemingly—although there is no absolute proof—the cause lies in some peculiarity or property of the invading organism.

The association of acute abdominal pain, with or without vomiting, with acute upper respiratory infections has long been recognized, and attention has frequently been called to it by medical writers. The combination is so common that one is rarely ever misled to consider acute abdominal inflammation. As a rule, the abdominal pain is general or in the upper abdomen, while localized pain and muscle spasm are absent. At times,

however, there is localized pain in the lower right quadrant which simulates almost exactly the symptomatology of an acute appendicitis. I have in my records the history of three children in whom the diagnosis was so in question that an operation was decided upon. In each of these a normal appendix was found, but in the mesentery a mass of acutely swollen lymph-nodes, some as large as a pea, which had given the localized symptoms. In each case nodes were removed for microscopic examination, and showed simply the usual picture of inflammation. One, of course, never sees these acute upper respiratory infections at autopsy, but it is easy to conceive or theorize into the view that in these cases of acute gastro-intestinal disturbances, accompanying the upper respiratory infections, there is an involvement of the mesenteric lymph-nodes.

Another common sequelæ or secondary involvement associated with upper respiratory infection is the development of pyelitis. This form, as a general rule, is mild and with little or no signs of retention and fever. Either one finds that the child does not recuperate as she should after a cold and an examination of the urine reveals pyuria, or else a diagnosis of pyuria is made and a careful history discloses a "cold" a short time previously which was so mild the physician was not called, and the event almost forgotten. The case records of every pediatricist contain numerous examples of such histories.

During the last three months we have been observing in St. Louis an unusual number of cases of a rather peculiar type of lung involvement, associated with acute upper respiratory infections. A typical example is that of H. P., eleven years of age. On December 10th last he developed what was apparently an ordinary rhinitis and pharyngitis with a temperature of about 102° F. The usual treatment of rest in bed, catharsis, and local antiseptics was prescribed. In two days the temperature was down to normal, and inflammation was rapidly subsiding. There was considerable cough at night. On examination the third day an area was found in the lower left axillary region over which numerous small, fine crepitant râles could be heard. There was no change in breath sounds nor any impairment in resonance.

The respiration was not rapid, nor were there any of the usual signs of pneumonia. No diffuse bronchitis was present. This area persisted some six days. The temperature continued from normal to 100.2° F. for three days, but the last three were afebrile. The process in the lung was always localized. During the next three months some twenty odd cases similar in pathology and symptomology were seen in private practice and consultation. All cleared in from three to ten days with rest in bed. In not a single case was there a clinical picture which might have been described as a bronchopneumonia. Except that the râles were fewer and finer as a rule, the picture was quite the same as that seen in the chronic lung processes associated with chronic sinusitis. One can only theorize as to the nature of the condition, but it would seem as if during this recent epidemic of upper respiratory infections the organism prevalent had some peculiar selective affinity.

In infants and young children the relationship between upper respiratory infections, particularly those which extend to the middle ear, and diarrheal disease is not sufficiently appreciated. It is an association to which attention has been drawn by Jeans, Marriott, and others in the last two or three years, and which has been arousing considerable attention among pediatricists. For many years a certain number of acute gastrointestinal infections in infants and young children have been classified as par-enteral infections—meaning that the gastrointestinal symptoms (vomiting and diarrhea) were not due to a primary infection of the gastro-intestinal tract, but were secondary to an infection in some other part of the body. A typical history is that of E. H., aged seven months. In January last the baby was taken acutely ill with a high fever and vomiting, and this was followed in a few hours by a profuse watery diarrhea. Following the limitation of food the diarrhea persisted as did the vomiting. An examination the second day showed a slight haziness of the right ear-drum. This was incised, and the temperature dropped, and the vomiting and diarrhea at once subsided. In many of these cases the evidence of upper respiratory infection is so slight that it is overlooked and is

further masked by the violence of the gastro-intestinal symptoms. In a number of these cases where the gastro-intestinal symptoms have persisted and little can be noted in the throat or pharynx, it has been found that there has been an extension of the bacterial infection to the mastoid. This may produce little or no change in the ear drum, or localized symptoms in the mastoid process. One finds the picture of an acute infection with persistent gastro-enteritis which does not respond to the usual dietetic treatment. At times, the mastoid infection can be diagnosed by a sagging or bulging of the upper posterior wall of the auditory canal. Incision into the mastoid in these cases has in numerous instances revealed the existence of pus, and, as soon as drainage has been established, the gastro-intestinal symptoms, however, at once subsided. This type of par-enteral gastro-intestinal infection has been noted in epidemic form by some observers. It is a frequent source of gastro-enteritis during the winter months, but must not be confused with the direct bacterial infections of the gastro-intestinal tract which are so common in summer and early fall months.

Chronic Infections.—Perhaps even more important than the systemic manifestations of acute upper respiratory infection are those which are connected with chronic infection. As a general rule, when the infection becomes chronic we find its seat in the tonsils or paranasal sinuses. In many cases the toxic reaction in some remote part of the body has its development from the time of the acute infection of the upper respiratory tract, but often one sees these systemic manifestations develop only as time passes and a chronic infection persists. Or we may look upon it in another way. We may consider many of the cases of arthritis, nephritis, carditis, toxic gastro-enteritis and the like to be the result of focal infection, and in a large part of these the focal infection is localized in the upper respiratory tract.

In the beginning of this discussion we quoted the history of a child who illustrate the connection between chronic recurrent gastro-intestinal disease and chronic upper respiratory infection. Another striking example of this was a young boy of three years who had been having recurrent attacks of spasmodic colic with

pain centering about the umbilicus. These attacks would lead to an upset with loss of weight which had kept him at a stationary weight for over a year when he first came under my observation. It had been found that atropin was about the only source of relief and his parents had finally come to rely upon this at frequent intervals. He had been taken from one physician to another, both in Europe and America, and his parents possessed a collection of diet sheets that could only be classed as weird and wonderful in their contradictions. For some reason, the fact that the child had a chronic hypertrophy of the tonsils and adenoids and that there were definite signs of chronic infection (adenitis) had been overlooked, or not considered of etiologic relationship. Believing that such types of recurrent pain are toxic in origin, it was insisted that the tonsils and adenoids be removed preparatory to any further treatment. This was done and at once the attacks of abdominal pain ceased. The child began to put on weight and improve immediately. Since then—some three years in all—the condition has not returned and the child's development has been uninterrupted.

There is seemingly in some children a direct etiologic relationship between chronic infection of the upper respiratory passages and digestive disturbances. These cases can only be distinguished by careful observation and study, and the removal of tonsils and adenoids in many cases does not exert the slightest effect upon the digestive disturbance and malnutrition. But in dealing with badly nourished, underweight children, or children with periodical attacks of abdominal pain, particularly those in which the pain centers about the umbilicus, or with children with acidosis; the possibility of the gastro-intestinal disturbance being secondary to a chronic upper respiratory infection should always be kept in mind.

The relationship between acute tonsillitis, carditis, acute rheumatic fever, and chorea is so well known that it needs no discussion. It is not so well known, however, that a chronic infection of the upper respiratory tract which is overlooked will bring about a condition of chronic chorea. Thus in the case of B. G., aged twelve years, when he came under my observation.

Some three years previously he had an attack of chorea following tonsillitis. The tonsils were removed, but the chorea persisted. Fortunately, the heart was not affected as is so frequently the case with persistent chorea. For the three years the boy had never been free from chorea which had exacerbations so severe that he had been kept from school. Although on clinical examination and from the history there was no evidence of chronic upper respiratory infection it was decided to take roentgenograms of the paranasal sinuses, as no other source of infection could be found. There had been no symptoms of sinus trouble, but the picture showed an involvement of the antrum on both sides. These were opened and drained and at once the choreiform movements started to disappear. After two months' treatment the boy was free from the chorea for the first time in three years.

In the rare arthritis deformans occurring in childhood the source of the toxemia is not infrequently in the upper respiratory tract. J. D., aged eight years, had developed a low-grade, chronic arthritis which was progressively becoming more disabling. His nose and throat had been examined by two laryngologists who had found no evidence of disease. The tonsils were small and seemingly not infected. As the condition was becoming worse it was decided, nevertheless, to have the tonsils removed. At the base of one a small encapsulated abscess about half the size of a small white bean was found. Following the tonsillectomy there was a rapid improvement in the arthritis. We have seen several cases in which the arthritic symptoms were associated with a low-grade chronic infection of the paranasal sinuses. Local treatment by heat or general medicinal or dietetic treatment has no effect upon these cases.

It has been found in recent years that a close relationship exists between upper respiratory infection and nephritis in childhood. Every physician is familiar with the acute hemorrhagic type of nephritis following a "sore throat"—whether or not the "sore throat" is a part of scarlet fever. It seemingly is not so well understood that many of the cases of parenchymatous nephritis have a focal infection as a cause, and in studies made at the St. Louis Children's Hospital by Clausen the nasal sinuses

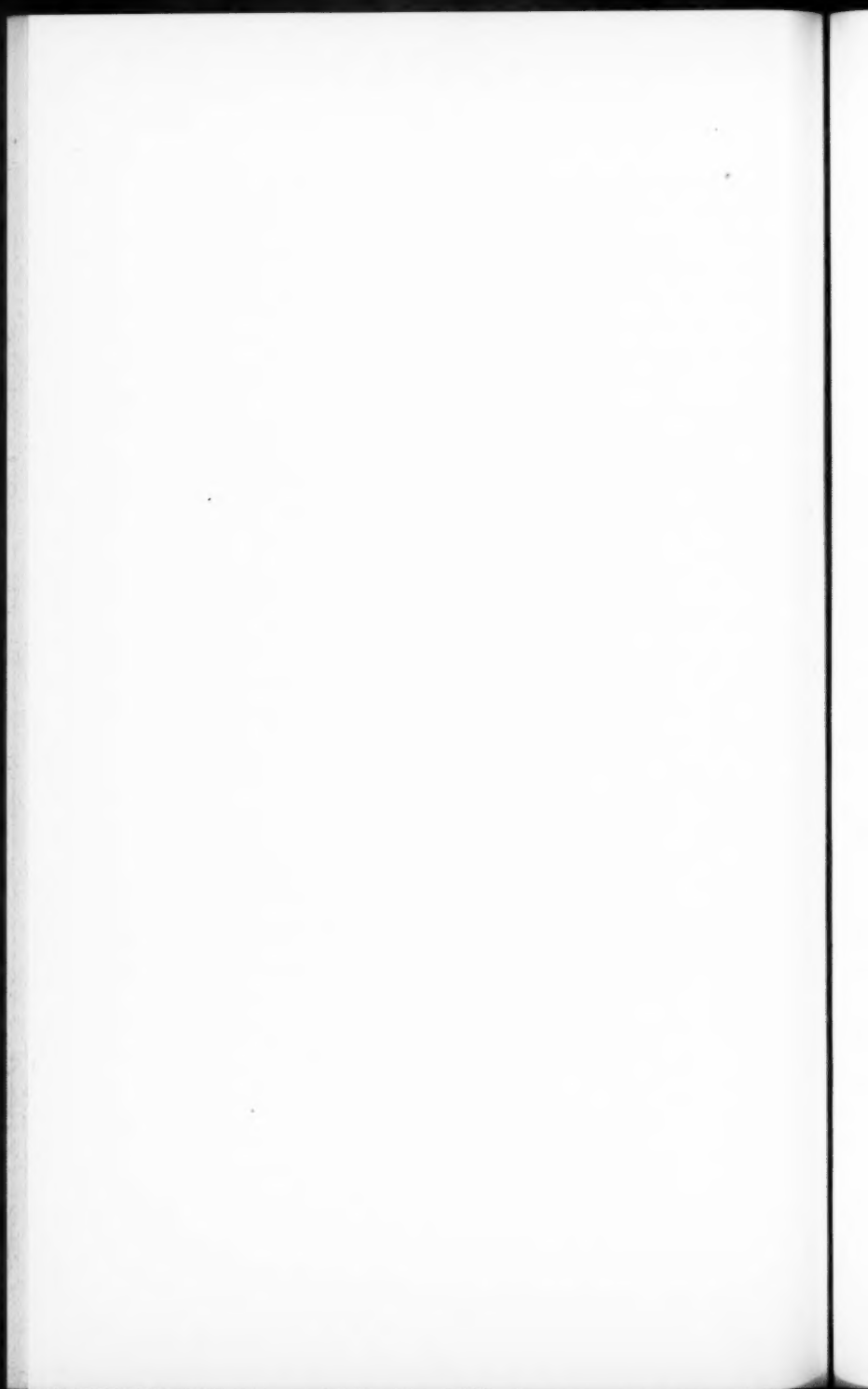
were almost invariably found involved. While the streptococcus is considered as the infective organism leading to the acute hemorrhagic nephritis, in the sinus infections some variety of the staphylococcus was usually present. In some of these cases rapid improvement followed the opening and drainage of the antrum.

One of the most serious and persistent types of trouble that we have to deal with is chronic non-tuberculous pulmonary disease associated with chronic nasal and paranasal sinus infection. G. H., aged six years, is an example of this type of difficulty. In the fall of 1925, following several colds which invaded the sinuses, he developed a persistent cough with râles in the left axillary region. Roentgenograms showed a haziness about this area. As the upper respiratory infection would improve the lung signs would disappear only to recur with fresh colds or exacerbations. Tuberculin tests were repeatedly negative. (This type of infection is repeatedly mistaken for pulmonary tuberculosis.) Despite bed rest and quartz light therapy in addition to local treatment, the pulmonary process persisted and finally the child was sent to Arizona. In three weeks of dry climate the cough disappeared and the boy started to improve and gain weight rapidly. Shortly after returning to St. Louis in the spring the child had an acute upper respiratory infection, and the lung signs reappeared to disappear again with warm weather. He spent the summer of 1926 on the beach in California and this last fall no evidence of trouble could be found. In January last he had a severe upper respiratory infection involving the sinuses and again localized pulmonary signs developed. The danger lies in the production of a bronchiectasis which will give trouble for many years.

I have attempted in this clinic to draw attention to the seriousness of the "common cold" in infants and children. We are not only dealing with a localized process which may in its acute stage lead to systemic manifestations, but the low-grade chronic, and recurrent infections are potential sources of serious disease elsewhere. In these systemic manifestations of a toxemia, as recurrent gastro-intestinal disease, nephritis, arthritis, and

the like, one must always take the upper respiratory tract into consideration and search for the signs of a chronic localized infection. Often a chronic sinus trouble cannot be localized by nasal examination alone, but roentgenograms are necessary. But all of these toxemias cannot be attributed to upper respiratory infection and other sources must be taken into consideration. Above all, one must not look upon the tonsils and adenoids as the source of all of childhood's troubles. Far too many needless operations have been performed. In an infant the tonsils are rarely ever the source of trouble either by their size or by being the seat of a chronic infection. Hypertrophy of the adenoids, on the other hand, is a frequent source of trouble in infants and the removal of adenoids is indicated many times when the tonsils should be let alone. All too often one sees the removal of both tonsils and adenoids followed by a compensatory hyperplasia of the lymphoid follicles of the mucus membrane of the pharynx which causes an obstinate and troublesome throat condition. The chief reason for the removal of the tonsils lies in their relation to an actual or a potential systemic toxemia, and this should always be the point at issue when the question of a tonsillectomy comes up. If possible, the tonsils should be kept in in all cases until the fourth or fifth year, even if an adenectomy is indicated before this period.

When the sinus is involved drainage or washing out is usually indicated. However, with drainage and washing many children will not improve or get well in a northern climate during the winter months, and, if the systemic infection or toxemia is severe or persistent, it sooner or later becomes necessary in many instances to send the child to a warm, dry climate to prevent serious disability.



CLINIC OF DR. FRANCIS M. BARNES, JR.

ST. LOUIS CITY SANITARIUM

EPILEPTIC MENTAL DISORDERS

WE have for our topic today the consideration of a disorder or disease of the nervous system which, though it has perhaps been known since the beginning of medically recorded time, still possesses an interest and intrigue which continues to merit wide discussion and considerable speculation. Almost innumerable theories have been advanced from time to time, and are still being advanced at the present, to explain the nature of this disease, and speculations concerning its etiology, its basic underlying pathology, and its verity are extensively rife. Throughout the centuries past from the time of Hippocrates there has been accumulating a voluminous literature dealing with epilepsy, its nature and manifestations. In the relatively limited time at our disposal it will, of course, be quite obvious to you all that we can only hope to touch upon some of the more important phases of this entire situation, and to point out in connection with these some special features which it is our purpose to emphasize in this course.

It is possible that the ever-living interest shown in the study of the "sacred disease," as described very ably by Hippocrates, and epilepsy as we know it today, exists in part, at least, from the fact that epilepsy in its motor manifestations is one of the most spectacular conditions of all of those with which the neuro-psychiatrist has to deal. Although mental disturbance was recognized as a part of epilepsy by Hippocrates, and although as far back as a couple of centuries ago the different types of mental disorder occurring in connection with this disease were set down, it has really been within recent decades that the appreciation of

the large element of mental disorder associated with epilepsy has come. Whereas, in former times, the seizure itself was looked upon as the essential feature of the disease, today mental and nervous disorders, even without any motor disturbances at all, are considered as direct symptoms of epilepsy. I think we can say, that the mental accompaniment of an abnormal character has become more important than was originally the motor disturbance as evidenced in the fit. As a result of this trend we hear nowadays commonly of psychic epilepsy, and the psychic equivalent of epilepsy, and other terms in which the disorder of the psyche itself comes out much more prominently than does the physical side of brain disturbance as shown by the convulsion. And it is especially with these mental features that we wish to deal in this talk today, although as a basis of our consideration we will briefly review some of the more common and prominent features of the disease as a whole.

Before beginning our consideration of epilepsy as an entity it is decidedly important that we have a clear understanding of what we are going to include under the term epilepsy. There is still that wide-spread tendency to make a diagnosis of epilepsy in any patient where there occurs a fit or convulsion or loss of consciousness, without due consideration of the possibility that this disturbance may be symptomatic of some other condition than true epilepsy. It is evident that it should require but very little thought, and that, too, of a quite superficial character, to realize that such a procedure will only lead to confusion, and will not assist in a further study or fundamental understanding of the disease. You only have to recall to your mind that there are convulsive seizures, which we speak of as epileptiform, occurring in conditions such as dementia præcox, perhaps in 25 per cent. of all such cases. They also occur in cases of multiple sclerosis, and, of course, with brain tumor, cerebral syphilis, paresis, encephalitis, abscess of the brain, and in cases where there is brain or skull injury. We also meet with convulsive attacks occurring in conditions where the brain or central nervous system is not primarily diseased, in such conditions as alcoholism, arteriosclerosis, drug poisoning, lead poisoning, uremia, diabetes, and the like. To

speak of these as epilepsies, whether we group them as acute or by any other qualifying term, does not assist. If we look upon the convulsion in such cases as the outward expression of the organic brain disease underlying, or of the intoxication which produces this motor discharge from the brain, and then recognize these as symptomatic and not as the disease itself, we will, of course, have a better understanding and a clearer basis for further consideration. In other words, it will be our attempt to consider epilepsy only in that form which cannot be looked upon as symptomatic of other diseases of the central nervous system, or as reflexly occasioned by disorders in other parts of the body, that type of epilepsy which, because we do not thoroughly understand its etiology, has been from time immemorial designated by the term idiopathic.

To gain an idea of the transition of viewpoint concerning the nature of epilepsy which has occurred it is only necessary that we go back to 1907 when Turner published his book, and therein epitomized the views of epilepsy up to that time in his definition, which is as follows: "Epilepsy is a chronic progressive disease of the brain, characterized by the periodic occurrences of seizures, in which loss of consciousness is an essential feature; commonly associated with convulsion, and frequently accompanied by psychical phenomena of a well-defined type; occurring generally in persons with a hereditary neuropathic history, which shows itself in signs or stigmata of degeneration; running its course uninterruptedly, or with remissions over a number of years; and terminating either in a cure, in the establishment of the confirmed disease, in delusional insanity, or in dementia." We find in this definition several interesting factors. In the first place epilepsy is considered by Turner as a chronic progressive disease of the brain. Next, he states it is characterized by the periodic occurrences of the seizures in which loss of consciousness is an essential feature. He recognized the psychical phenomena and emphasized the neuropathic heredity.

Perhaps Pierce Clarke emphasized the mental element in epilepsy of the idiopathic class, of which alone we are now speaking, more definitely and predominantly than have others up to

his time. He states that "given a certain potential constitution plus a special type of stress applied to it we gain a certain pathologic effect which we have called the epileptic reaction." The old recognized epileptic fits have no essential place in his conception of epilepsy.

There has always been an attempt to prove that true or idiopathic epilepsy was an organic cerebral affection, and this belief is becoming more generally accepted today. Yet Gordon Holmes defines true or idiopathic epilepsy as a cerebral disease without any demonstrable structural changes which can be traced in casual relation to it.

A conception of the explanation of the phenomena of epilepsy, wherein the mental factor is highly predominant, is very strongly expressed by March when he says that: "The phenomena of epilepsy is an example of an habitual abnormal expression of mental activity. The epileptic, when he meets unsurmountable difficulties, is beset with mental states over which he has no control. Everything which emphasizes the futility of his efforts serves all the more to increase his emotional stress, until the higher brain centers, which have to do with the directing and the consciousness of efforts, are exhausted from overwork because of this extreme nervous tension. This exhaustion means a cessation of function until a period of rest intervenes. So the patient suffers, according to the degree of fatigue or exhaustion which exists, a partial or complete loss of consciousness. This is not deep enough to involve the motor centers, so the emotion goes on to expression in muscular activity, partially or wholly, unguided and undirected, which we know as a convulsive seizure. When this is the patient's habitual channel of outlet for strong emotional states we denote the condition as epilepsy."

A number of recent writers, among whom we may mention Alford, have attempted to explain epilepsy by comparative arguments as an abiotrophy, a degenerative process. Groups of these various speculative concepts are offered here and there, but the very fact that we continue to have more explanations offered as years go by, shows in itself that there is not a consensus of opinion as to the underlying nature and cause of this time-

worn disease, of which there are in the neighborhood of a quarter of a million cases in the United States.

There is hardly any feasible factor which has not at one time or another been assigned as a cause of epilepsy. We hear commonly mentioned intestinal auto-intoxication, a decreased alkalinity of the blood, vasomotor disturbances, endocrine gland abnormalities, cranial and cerebral injury, and heredity. With reference to head injuries, Eager found on a review of 100 cases of injury to the head in the late war that there were 15 instances wherein epilepsy developed secondarily. The development of the epilepsy may occur immediately after the injury, or within a period of some months or years. It was interesting that in this 15 per cent., 12 were cases in which the injury had been to the parietal region of the brain. So far as true or idiopathic epilepsy is concerned, it is rather generally conceded that heredity is a most important factor. There have been claims made, that more than 80 per cent. of all cases of true epilepsy show an impaired heredity in that there is some disturbance of nervous character in the ancestry. Alcoholism, insanity, and neuroses are prominent factors. It is furthermore claimed by William Turner that 37 per cent. of the cases have a direct inheritance of epilepsy from the ancestors. He concludes that epilepsy, therefore, is a malady indicative of a family neuropathic degeneration, and is closely allied to such other conditions as insanity, alcoholism, and hysteria. The age of onset of true epilepsy rather supports the observation of the importance of heredity in its causation. Although it is true that epilepsy is a disease of all ages it is well recognized that there is a diminishing tendency to its occurrence as age advances. More than 50 per cent. of the cases onset between the tenth and twenty-third years of life. From birth to the ninth year more than one-fourth develops, the remainder occurring in the last third of life. The age of onset, apparently, likewise has some relationship to the prognosis because it is observed that the younger the patient the more severe is the prognosis. Incidentally, the prognosis in idiopathic epilepsy is not good. If we consider as recovery those cases in which there is an arrest of seizures for a period of eight or nine

years, we will find that this comprises about 10 or 12 per cent. of all cases. However, inasmuch as the seizure is now more commonly looked upon as but the spectacular motor accompaniment of the underlying disease, this should not be considered as the ultimate measure of recovery.

Inasmuch as the epileptic seizure or convulsion or fit, the physical manifestation of the disease in other words, has always occupied a prominent position in the symptomatology, it will not be amiss to spend a small part of our time outlining some of its outstanding features before we take up the consideration of our main object, namely the mental disorders associated with epilepsy. The seizures may be of unlimited variety, and, because of the fact that they occur during the night and are, therefore, unobserved, or because they may have been of slight extent in the form of petit mal, they may have existed for some considerable time before their occurrence has been realized. In general, one may say that the seizures fall in one of several different general types. Thus we have transitory attacks lasting but a few seconds or minutes. Again we may meet with such transitory attacks showing a very slight motor disturbance, but associated with clouding of consciousness. Also, with these there may be effective emotional disorders and accompanying anomalous impulsive acts. It is customary to divide the description of the epileptic convulsion into three stages, although it must be remembered that there are infinite modifications of this plan up to the occurrence of a true status epilepticus. First, there is the tonic stage lasting but a few seconds, followed by the clonic or convulsive stage of a few minutes' duration, and then the period of stertor. Following the seizure there is often a sleepiness or drowsiness lasting for from a few minutes up to hours in duration. We still refer, as far as the attack itself is concerned, to major or minor attacks, that is, the grand mal or petit mal variety. The minor attacks, or petit mal, may show but an instant of dizziness with slight mental confusion without the convulsion proper, but with motor impairment shown in the nature of an inhibitory action, a stopping of whatever might be under movement at the time. From the time of occurrence we

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speak of nocturnal and diurnal types of epilepsy. It is probably true that most epileptic seizures are followed by some kind of automatic actions, which may vary from simple movements up to the most pronounced violence requiring restraint. It is during this post-seizular period that many of the mental disorders develop, and it is because of these that the post-convulsive period becomes of great importance in the consideration of the epileptic as a general problem. It should be mentioned that in some epileptics the convulsions or minor seizures are at times replaced by suddenly developed mental disturbances, which may, of course, assume different forms, and of which we will have occasion to speak later on.

Of the other features of the attacks which are more or less incidental, and often accidental, we will have but little to say. Injuries are not infrequent as a result of convulsive movements. The tongue is bitten in about 22 per cent. of the cases, and there occur, of course, injuries to the scalp and face and head, fractures and dislocations are met with. Hemorrhages into the subconjunctival tissues, and under the skin of the face, eyelids, and neck are also mentioned.

Among the interesting features of epilepsy there are those experiences which a patient has preceding the onset of an attack, whether this be of the mental type or the motor convulsion, which are sensations warning the patient of the approach of an attack. These are spoken of as aura. An aura may be psychic, sensory or motor in character, and occurs in from one-third to one-half of all cases. They may occur for many years unrecognized as a part of the epileptic syndrome.

We come now to a consideration of those changes in mentality which are met in epileptics. It is really not surprising that there should be found mental abnormalities of one kind or another in a person who evidences by the epileptic fit the presence of a very serious disturbance in the nervous system. By far the greater majority of epileptics reveal in their mental reactions some abnormality which may be, to be sure, very slight, or may be more extreme, even to the occurrence of actual psychosis. It should not be forgotten, either, that we do now and then meet with epi-

leptics in whom our examinations are not sufficient to show any mental change. It is natural that, in attempts to classify or describe the various mental disorders associated with epilepsy, the fit itself should be the point of departure in many of these attempts. Thus from the older times we have found these mental disorders classified as occurring before or after seizure, in the interval between seizures, or replacing the seizures.

At all events, there are two main possibilities, that is, the mental disturbance may occur as an acute manifestation associated with the fit, or it may occur as an acute manifestation in the interval between the seizures. This in itself is a matter of small importance. However, it is not of so small importance that we should ask if there is any difference between those psychoses which occur in connection with the seizure, and those which occur during the interval between seizures. May we not look upon these actual psychoses occurring during the interval as but an exacerbation of the always-present epileptic constitution. Is not this epileptic constitution, so far as the mental side of it is concerned, the chronic underlying condition, the soil upon which the more active psychoses may flourish? Perhaps these mental disturbances, somewhat like the fits, are but a periodic fluctuation of the psychical equilibrium. Apparently this is a valid supposition, because we do observe that paroxysmal psychoses may replace the single fit or a series of fits. Here we have those conditions which I refer to as the psychic equivalent of the convulsive seizure. Frequently these transient psychic disturbances are the prodromata of the convulsive seizure itself, preceding it by a day or two in many instances.

The epileptic temperament or constitution, so far as the psychic peculiarities or characteristics (if there be any) are concerned, is extremely variable. In general it may be stated that the epileptic is an unreliable person, emotionally unstable, and uncertain. Variability of mood is a prominent feature in the epileptic temperament. These individuals, furthermore, are changeable in their moods, they may at one time be gay, apparently happy, even euphoric, where again they are found moody, gloomy, and depressed. Usually there is suspicion in

their make-up. Their suspicion is sufficiently prominent at times to make of them an abortively developed paranoid complex. Though many epileptics, aside from the fits, are quiet and good natured, it must be remembered that not infrequently we find the opposite, namely, those who are aggressive, and subject to violent outbreaks of temper and passion. They do not show much interest in exertion, whether this be of a physical or mental character. A transitory ill-humor is found in four-fifths of the cases and is shown in the irritability which has been mentioned, the unreasonableness of their acts and thoughts, and even may at times be associated with delusions and hallucinations. The epileptic constitution not seldom reveals a mental attitude of definite infantile character. There is a craving for attention and praise, and a great amount of assumed self-importance which reveals the egocentric twist to his mental processes. Not infrequently hypochondriasis, with complaints of many and varied character, is a prominent feature, and again reveals the egocentricity of the individual. This self-centering process is associated with a gradually retracting field of interest. It is often noted that the epileptic is over-religious or at least in spells shows this increased activity in which there is manifested an apparently genuine, but probably only superficial, interest. Though there may be attacks of violent temper, as has been mentioned, the epileptic, as a matter of fact, shows in his constitution an emotional poverty. There is increased egotism and assurance which is out of proportion to their achievement. Memory usually shows some impairment. Ideas of right and wrong, and responsibility to self, family, and community are poorly balanced or developed, and often vague and indefinite. A religious fervor, frequently present as stated previously, often contrasts with the actions of the individual in exactly an opposite manner. On the basis of all of this, judgment, powers of reasoning, and critique are usually found enfeebled. Occasionally in epileptics we find instances of excessive sexuality, and this, too, in forms of perversion. Thus we meet with instances of exposure, exhibitionism, sadism, and the like as the expression of epileptic mentality.

As the disease progresses in point of time, mental peculiarities, which may not have, up until a certain point, been of sufficient intensity to deserve the term of psychosis, become more marked and evident, and more chronic, and definitely psychotic. It has been claimed often that the progressive intensification of psychotic disturbances in epileptics became more evident as the disease went on, due to some effect exerted by the epileptic attacks themselves. In reality it is rather difficult to determine whether or not the seizure has anything to do with the intensifying of the mental deterioration, or whether this mental process is not fundamental and independent of the seizure, and a part of the constitutional defect, and like the seizure but an outward expression of this defect. The latter seems the more tenable position. We, at least, know of certain evidences of mental disorder in epileptics before seizures of any nature have occurred, or even before the disease has been recognized as epilepsy.

The age at which epilepsy develops appears as an important and governing factor in the type and extent of the mental disorder to appear. Thus where epilepsy develops in youth it frequently leads to mental states of feeble-mindedness. The main features of the mental state in chronic epilepsy are a gradual reduction of intellectual capacity, a deterioration, even to the extent of feeble-mindedness in youth, or dementia in the adult, this being shown by slowness in general psychic reactions, difficulty in understanding, grasping, and assuming new ideas, a resultant poverty of ideas and narrowing of the fields of interest, with a memory defect which is much greater than the deterioration would lead to expect. Of course, naturally, in the chronic epileptic, where psychic disorders have developed to a grade beyond that noticeable in the epileptic constitution, there are some of the elements of that constitution noticeable in the psychosis. Namely, there is the same egotistic supersensitiveness and emotional poverty with the definite infantile characteristics.

As has been said earlier in this hour, we may have psychic disorders appearing before or just following an epileptic seizure. These psychic disturbances, amounting at times to psychoses, are frequently very transient in duration. Some time back, in

speaking of the various types of aura, we mentioned those of psychic character, and here we meet with such psychically abnormal elements as depression, exaltation, irritability, impulsivity, gaiety, rage, and quarrelsomeness. It is questionable if these symptoms just related should be looked upon as aura of a psychic nature, or as an actual mental disturbance preceding the convulsive attack itself. Possibly even from a practical standpoint the answer to this speculation is not of great importance. However, it would seem that where these mentally abnormal features present themselves antedating the motor discharge by one, two, or three days, or more, that they should and would better be considered as psychoses. We find in these transient prearoxysmal psychoses intensification of the characteristic defects noted in the epileptic constitution, such for instance as fleeting irritability, feelings of apprehension or fear, a dream state, an insufficiency of thought coupled with a lethargy, a brief impairment of memory, and sometimes even definite hallucinations and delusions may be present. Occasionally we find quite the opposite of this picture presented. Postaroxysmal psychical phenomena of abnormal type are presented in several different varieties. These disturbances may be transient in character or more prolonged. We sometimes find clouded mental states with amnesia and, if the psychosis continues, there is eventually deterioration and dementia. In others again there is deep grade of confusion, bewilderment, and anxiety associated with excitement, possibly hallucinations, fear and violent outbreaks, ecstatic moods, and religious fervor.

A most important postseizural phenomena from the psychic standpoint is found in the states of automatism which most epileptics show following the fit. These may vary from simple automatic movements, such as dressing or undressing, up to disturbed conditions with pronounced violence. In these latter there is always the element of extreme danger. Sometimes these conditions of automatism appear where there has been no recorded seizure. Possibly in these instances there may have been a seizure of minor character which was not observed, although it is a well-recognized observation that the seizure may not occur

at all preceding the automatic period. This period of automatism may follow the psychical equivalent of epilepsy of which we will have occasion to speak later on. During the period of automatism a person may carry out very complex movements, and act in quite complicated situations as though perfectly conscious, and, even though observed by friends and relatives, it may not be recognized that he is carrying out these acts volitionally and with complete conscious awareness of what is transpiring. It may, indeed, be quite difficult to decide whether the acts above mentioned are done in a wholly or partially subconscious state, but if it can be shown that the patient has been subject to epileptic seizures there is always a reasonable ground for the belief that an unnatural, unusual, or perverted act may have had its origin in a state of postseizural subconsciousness, or during a psychic equivalent of the epileptic attack. These attacks of automatism following psychic epilepsy may last for a few hours or for days. During this period acts of violence may be committed. Impulses are not infrequent, and of these the more common are impulses toward suicide and homicide. Exhibitionism, dipsomania, and pyromania are noted as following epilepsy.

Where an abnormal state, lasting in duration from a few hours up to several days or more, replaces the usual motor seizure, we speak of the psychic equivalent of epilepsy, or psychic epilepsy. We speak of this as psychic epilepsy, because, during this attack of mental abnormality which replaces the fit consciousness is disturbed and memory is impaired. Psychic attacks should conform to certain conditions before we are justified in regarding them as psychic equivalents of the epileptic seizure. In the first place there is to be noted the association of this psychic attack occurring in the same person with evidence of the usual epileptic phenomenon, that is, major or minor attacks or vertiginous spells with interference of consciousness. There is noted further a certain uniformity of the type of these attacks, the mental paroxysm reproducing in a way many of the features of the former attacks as observed in the same person. These psychic attacks are often preceded by a prodromal mental state in which there is evident irritability, suspicion, and apprehension, and it may be

accompanied by various somatic sensations corresponding to those which precede the ordinary convulsions such as headache, depression, sensory warning, and other like aura.

We may find the attacks of psychic epilepsy occurring in two main varieties. The first, short attacks or true psychic epilepsy, and the second, more prolonged attacks which we recognize as epileptic automatism. It is in these more prolonged psychic attacks that we meet with the possibility of acts of violence. In these cases of epileptic automatism, lasting for a considerable period of time, it may be difficult to decide whether the complex acts, such as wandering at a long distance from home, and avoiding dangers, and conducting themselves in an apparently normal manner so far as onlookers or friends can determine, are done in a wholly or partially subconscious state.

In a study of one thousand habitual criminals it was found that $7\frac{1}{2}$ per cent. were subject to epilepsy. The automatic state and conditions of altered consciousness which occurs, are of great importance from the medico-legal aspect, because, while in these states of automatism, the patient is not consciously aware of what he does and is unable to know the difference between right and wrong and, as he preserves no memory of his actions on his return to his normal level, he is unable to place them in the rational relationship to his ordinary life. The aberrations of consciousness in these states vary from complete loss to only the slightest disturbance. Medical evidence in the case of an epileptic charged with a crime is not, therefore, capable of affirming non-responsibility, but it can often show that there is a reasonable probability that the accused committed the crime while in an abnormal mental state.

It is interesting to note that one feature, more or less peculiar to the psychic equivalent, is shown in the tendency for the psychic element to increase both in severity and frequency as the classical features of ordinary epilepsy lessen or disappear.

A few words regarding diagnosis and treatment and we will be done. The diagnosis of idiopathic epilepsy necessitates a careful and thorough history of the antecedents as well as of the patient. A thorough physical examination, using any indicated

laboratory investigation, is equally essential in order to rule out certain other conditions of which the epileptic attack may be symptomatic. When these qualifications are met there is usually but little difficulty in arriving at a correct conclusion. The differentiation of true epilepsy from hysteria, especially when there are elements of both conditions present as exemplified in hysterio-epilepsy, at times offers considerable difficulty, and in some instances the final conclusion cannot be reached until after a sufficiently long period of observation has been possible.

Pretty nearly every drug known has at one time or another been used in the treatment of epilepsy, and from time to time one or another drug has been heralded as a cure. At the present time luminal occupies the center of the stage in so far as medication of this disease is concerned. There are other elements in the case which require special measures beyond those afforded by drugs alone. It is not infrequently necessary that an epileptic be interned in some institution because of the mental abnormalities which may be presented either in the form of the epileptic constitution, or in the form of psychotic states developing in association with the fit or as a replacement of the same. Especially is this true in those epileptics wherein there are associated with the mental abnormality tendencies of dangerous character, or where the epileptic automatism is sufficiently prolonged that the individual cannot be considered safe either as regards himself or others. Epileptics who show homicidal, suicidal, or other conduct of criminal character should be restrained in a proper institution as long as their condition remains such as to make it at all likely that a recurrence of these tendencies will appear.

CLINIC OF DR. G. O. BROWN

FROM THE DEPARTMENT OF MEDICINE, ST. LOUIS UNIVERSITY SCHOOL OF MEDICINE, AND THE MEDICAL SERVICE OF ST. MARY'S INFIRMARY

A CASE OF PERNICIOUS ANEMIA WITH PRONOUNCED NEUROLOGIC SYMPTOMS, WITH REMARKS ON CERTAIN BACTERIOLOGIC AND SEROLOGIC FEATURES OF THE DISEASE

THE case about to be presented is of interest because the pronounced neurologic symptoms suggested a diagnosis of tabes dorsalis. More careful study proved this to be incorrect.

The patient, a white male, carpenter, aged sixty-six years, entered the hospital complaining of the following symptoms:

1. Marked general weakness.
2. Difficulty in walking and in using the hands.
3. Cramp-like pains in hands and feet.
4. Slight incontinence of urine.
5. Numbness of hands and feet, and entire body with exception of head and neck.
6. Feeling of distention in abdomen after meals.
7. Occasional attacks of diarrhea.

The patient had been in fairly good health up to eight months before his entry into the hospital. At this time he had a severe attack of diarrhea lasting more than a week. Following this for a month or more he felt quite weak, but then became somewhat better. Occasional periods of looseness of the bowels alternated with constipation. There has been no recent recurrence of the diarrhea.

In the past two months the patient has noted abdominal distention and discomfort after meals. No nausea or vomiting has occurred. He has not passed bloody, tarry, or clay-colored stools.

No definite jaundice has been noted at any time. His appetite has been very poor in the past few weeks.

The patient has not had his full strength for several months, and in the last two months weakness has become progressively more marked. At the present time the patient is unable to walk without assistance. This is partly due to weakness, and partly to difficulty in handling his legs, which of late has been a marked feature of his illness. Awkwardness in the use of his hands makes it very difficult for the patient to feed himself. Numbness and tingling of the hands and feet first attracted his attention about six weeks ago. It gradually spread from his hands and feet up the legs and arms to the trunk, finally involving the entire body, with the exception of the head and neck. Cramp-like sensations in the muscles of the arms and legs appeared about the same time.

In the last three days slight incontinence of urine has been noted. In the same period nocturia, which had previously been absent, appeared.

Since the onset of general bodily weakness, palpitation of the heart has also occasionally been noted.

The patient had measles and mumps in childhood and an attack of pneumonia at the age of thirty-six. A few mild attacks of tonsillitis have occurred. No serious injuries or operations have been experienced. He denies having had syphilis or gonorrhea. He has had some slight trouble with hemorrhoids, but practically no loss of blood from bleeding hemorrhoids has come to his attention. His teeth have caused considerable trouble and all except a few on the lower jaw have been removed. There has been little loss of body weight.

The patient uses tobacco moderately, and denies the use of alcoholic drinks or drugs.

The patient's family history reveals no evidence of disease similar to that from which the patient is suffering. He has been married twice. Four children by his first wife had died in infancy. There was no history of miscarriages by either wife.

Physical examination reveals a fairly well-nourished individual. His skin is quite pale with a tinge of yellow. The hair

is thin and gray. The pupils are equal and regular, and react normally to light and distance. His lips and buccal mucus membrane shows a well-marked pallor. The tongue shows definite atrophy of the papillæ with a tendency to reddening along the edges. A small petechial hemorrhage is seen in the mucus membrane of the lower lip. The teeth that remain show some pyorrhea and dental caries.

No enlargement of lymphatic glands is found in the neck or elsewhere.

The thyroid gland is not enlarged.

The chest is fairly well formed. The heart is found to be slightly enlarged to percussion. A systolic murmur is heard over the precordial region, but is not transmitted to the axilla or the vessels of the neck. The cardiac rhythm is regular. The blood-pressure is low, 100/70 mm. Nothing abnormal is noted in the examination of the lungs.

The abdomen is not distended or rigid. The liver extends about 4 cm. below the right costal margin. It is smooth and not tender. The spleen cannot be felt.

The lower extremities show no edema.

The knee-jerks and ankle-jerks are absent even after reinforcements. No pathologic toe signs can be elicited. The biceps and triceps reflexes also seem absent. There is definite evidence of incoördination when the patient attempts movement of the arms and legs with his eyes closed. Tests of station and gait are unsatisfactory, because of the marked weakness which the patient exhibits.

The x-ray examination of the chest showed merely a slight widening of the aortic arch, and some increase in the peribronchial markings extending into the lower lobes on either side. Examination of the gastro-intestinal tract was entirely negative. A few exostoses are seen on the bodies of the vertebræ.

The electrocardiogram showed left ventricular preponderance, diphasic "T" waves in all leads, and an A-V conduction at the upper limits of normal.

The Wassermann reaction in the blood is negative.

The spinal fluid is found to be under no increase of pressure.

A cell-count shows 2 to 3 cells per c.mm. The globulin reaction is negative. The Wassermann on the spinal fluid is negative.

The urine gives negative tests for albumin, sugar, diacetic acid, and acetone. Microscopically no casts, and very few pus-cells are seen.

The blood-sugar is 98 mg. per 100 c.c. The blood non-protein nitrogen is 37 mg. per 100 c.c. Blood phosphates 4.1 mg. per 100 c.c. Blood chlorids 640 mg. per 100 c.c.

The white count shows 5000 leukocytes per c.mm. A differential count shows: Polymorphonuclear neutrophils, 69 per cent.; small lymphocytes, 19 per cent.; large lymphocytes, 8 per cent.; large mononuclears, 3 per cent.; eosinophils, 1 per cent.

The red count is 2,045,000. Hemoglobin (Newcomer method) 56 per cent. Hematocrit determination shows 25 c.c. of red corpuscles per 100 c.c. blood. Color index, 1.3. The smear shows some anisocytosis and poikilocytosis, and rather numerous macrocytes. No nucleated red cells were found.

The blood bilirubin, as determined by the van den Bergh test, is found to be 0.8 mg. per 100 c.c. plasma. A delayed direct diazo-reaction is obtained.

The gastric analysis, using the fractional method, shows entire absence of free hydrochloric acid in all specimens. The total acidity varies between 17 c.c. and 6 c.c. of N/10 HCl per 100 c.c. Microscopic examination of the gastric contents shows, besides starch granules and bacteria, numerous yeast-like organisms.

Culture of the gastric contents on maltose agar of acid reaction yields a culture of monilia. Repetition of this culture on the fasting contents gives a similar culture. Further examination of this organism shows it to be morphologically and culturally identical with the monilia psilosis of Ashford.

Examination of the patient's blood-serum by the monilia complement-fixation test gives a positive reaction.

Discussion.—The symptoms of which the patient complains might well be due to tabes dorsalis. The negative history, the lack of changes in the pupillary reflexes, the normal cell-count in the spinal fluid, the negative globulin reaction in the spinal fluid, and finally the negative Wassermann reaction in the blood

and spinal fluid are strong evidence against syphilis of the nervous system.

The neurologic aspects of pernicious anemia are now a well-recognized feature of the disease. In some instances the degenerative cord lesions seem to precede the development of the anemia. Numbness and tingling of the hands and feet is the most common symptom complained of by the usual case. However, all of the symptoms present in this case are at times seen. Seldom, however, are they seen to such a marked degree.

The laboratory evidence for pernicious anemia would here seem conclusive. There is a definite anemia of the high color index, macrocytic type. There is a tendency to leukopenia. The van den Bergh reaction shows 0.8 mg. of bilirubin per 100 c.c. plasma. With identical technic, the normal plasma bilirubin is found to be between 0.3 and 0.6 mg. There is, therefore, a slight increase in blood bilirubin. This feature of the hemolytic anemias, as has been shown in work already reported, is a valuable aid in differentiating them from the secondary types of anemia. The direct van den Bergh reaction is delayed, a test which differentiates the hemolytic increases in blood bilirubin from that due to liver damage. The absence of free hydrochloric acid in the gastric content is, of course, a characteristic feature of pernicious anemia.

The study of the yeasts found in the intestinal tract of cases of pernicious anemia is one of the recent phases of the investigation of this disease. Their exact place in its pathogenesis can not be said to be clear. We have recently reported work in confirmation of that of Wood, showing the frequent occurrence of these organisms in the alimentary tract of patients suffering from pernicious anemia. A study of a very large number of cases will be necessary before the exact frequency of their occurrence can be established. We have failed to find them in a few cases in our series. Some of these failures may have been due to lack of study of the gastric contents. Where the monilia are present the complement-fixation test has so far been found to be positive. In a large series of hospital cases the test is found to be negative in 85 per cent. In the remaining 15 per cent. giv-

ing positive reactions, many, where careful bacteriological examinations were made, showed the presence of the organism. Further work may show that this test is of some value in the differential diagnosis of pernicious anemia.

Our case, therefore, seems clearly one of pernicious anemia and our treatment will be directed accordingly. Unfortunately, the remissions of the anemia are not always followed by corresponding remissions in the neurologic symptoms of the disease.

CLINIC OF DR. DREW LUTEN

BARNES HOSPITAL

CORONARY THROMBOSIS OF LESSER SEVERITY WITH SPECIAL REFERENCE TO THE VALUE OF ELECTRO- CARDIOGRAPHY IN THE DIAGNOSIS

It is now well known that coronary thrombosis with myocardial infarction occurs much more frequently than was thought to be the case a decade ago. Attention has been directed by a number of observers to the findings which characterize cases of conspicuous severity. The picture presented has been one of a profound injury to the myocardium, and the grave import of such an insult has been quite properly stressed.

It has been pointed out, of course, that the extent of damage is not the same in all cases, and that prognosis depends upon the amount of damage; but coronary thrombosis has been described as a lesion always associated with extensive myocardial injury, and in discussions of prognosis, consideration regularly has been given to the question of how much, rather than to the question of how little damage the myocardium may have sustained. It is impossible, of course, to measure with any degree of assurance the extent of the lesion, and when the diagnosis has been made it is better to err on the side of caution, and to assume that the injury has been extensive, even though the evidence at hand might indicate a relatively small lesion.

Some patients die quickly; others are profoundly shocked and linger a few hours, a few weeks, or a few months; others recover and are able to carry on, but with myocardial efficiency seriously impaired. Still others suffer little if any demonstrable impairment. In these cases, with little evidence of permanent damage, the correctness of diagnosis might be questioned.

But since cases differ in extent, the question must occasionally arise. Just how little damage may have been done in a given instance? How small may be the occluded branch? How small may be the infarct? Must there, indeed, necessarily be an infarct in every case?

It has been shown that there is great variation in the coronary arterial tree. It has also been shown that anastomoses, much more numerous than was formerly recognized, occur in some instances. In patients with coronary sclerosis it seems likely that thromboses occur in branches that differ widely in size, that vary considerably in distribution, and that show great variation in the richness of their anastomoses. In such a patient, thrombosis might occur in a main limb of the coronary, or it might occur in the tiniest branch. And if anastomosis is quite free, may it not even be possible in certain instances for thrombosis of a small branch to occur without very serious symptoms or consequences? Might occlusion not even occasionally occur *without infarction*? It is not altogether uncommon for autopsy to reveal a healed infarct or several such lesions in a patient who had given no history that suggested coronary thrombosis. May it not even be that postmortem examination may fail to show infarction in a subject who had at some time in the past sustained occlusion of a small coronary branch?

It is natural that the severest cases were the first to be recognized. Autopsy established the diagnosis. The clinical picture was that of a fatal, or all but fatal, accident. Other patients presenting similar symptoms lived, and while some doubt might linger in the minds of the skeptical, the picture of coronary thrombosis with recovery became a more or less familiar one. And now when knowledge of the coronary circulation has become more exact, and patients with coronary sclerosis have been observed who present findings typical in character, but milder in degree than such as usually are ascribed to coronary thrombosis, the conclusion appears reasonable that this lesion may occur with all degrees of muscle damage, and that in some instances the extent of myocardial injury is comparatively slight.

Three cases are presented which exhibit, more or less typically, the classical syndrome of coronary occlusion. They apparently represent different degrees of myocardial injury, though in each case the presumption is great that the injury was less extensive than that which is commonly thought to result from coronary occlusion. In each case, fortunately, an electrocardiogram had been made before the occurrence of the acute symptoms which suggested a coronary accident. Subsequent electrocardiograms showed changes in the shape of the ventricular complex, particularly of the T wave. This change in the T wave expresses a change in the play of electrical potential in the myocardium; in other words a myocardial change. In the presence of findings which, except for their comparative mildness, were typical of coronary thrombosis, the demonstration of coincident muscle change was regarded as establishing the diagnosis of coronary occlusion as firmly as such a diagnosis can ever be made clinically.

Case I.—A man, forty-seven years of age, who knew that his blood-pressure had been a little higher than normal, awakened April 5, 1926 with a sharp pain in the cardiac region, tachycardia, and palpitation. He felt some pain for about two days. This was not relieved by nitroglycerin. Several days later, on rather vigorous exertion, he had a transitory pain again, and the following night awakened with pain which radiated down both arms. This lasted for about thirty minutes. Two days later he noticed a substernal pain, or dull ache on exertion. There were also certain gastro-intestinal symptoms. On April 14, 1926 he consulted Dr. J. Spencer Davis of Dallas, Texas, who noted precordial pain with radiation to both axillæ, a blood-pressure of 180/90, and a leukocyte count of 10,000. Dr. Davis made the electrocardiogram which is shown at the left of Fig. 49.

On April 17, 1926 he had severe pain, precordial, axillary (bilateral), and extending down both arms. The pain was incompletely relieved by morphin. For several days he was in a hospital. The record shows an elevation of temperature (up to 102° F.), and leukocyte counts of 13,400, 13,000, and 15,800.

The systolic blood-pressure at first was 145. After a few days it was 165.

He entered Barnes Hospital April 24, 1926. At that time he had no fever, there was no leukocytosis, and he was practically free from pain. There were no notable findings upon examination of his heart.

On April 26, 1926 an electrocardiogram (the second from the left in Fig. 49) showed a distinct abnormality of the T wave in Lead I. It will be noted that this branches off at a high level,

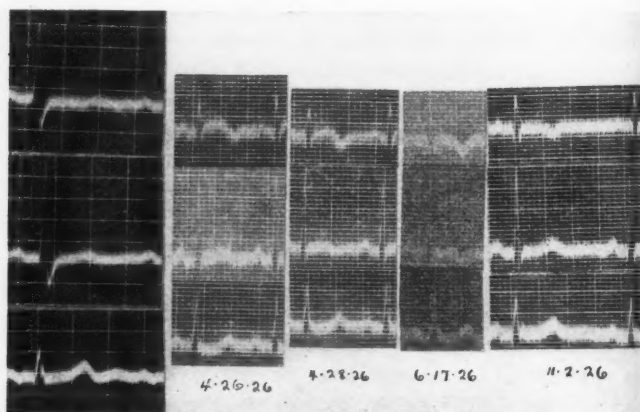


Fig. 49.—Electrocardiograms of the patient in Case I. At the left is a portion of the record made by Dr. Davis on April 14, 1926, three days before his attack. The second record was made April 26, 1926. Note the difference in form of the T waves, particularly in Lead I. Subsequent records show changes in the T waves, approaching the normal.

and after a rise, falls rather abruptly to a level below the base line. The differential diagnosis appeared to rest between some acute infection at the time of his symptoms, in a patient who already had perhaps some myocardial lesion associated with hypertension or arteriosclerosis on the one hand, and a coronary occlusion on the other. It was thought that a comparison of the electrocardiograms might offer valuable aid in differential diagnosis, and Dr. Davis very kindly sent a portion of his record of

April 14th. It will be observed that there is a conspicuous difference between the T waves of the two records. This is more pronounced in Lead I and less conspicuous in Lead III, the first portion of the T wave being lower in the Lead III of the later record.

After full data of the patient's acute illness had been obtained, the diagnosis, even without the electrocardiographic evidence, would hardly have been open to serious question, perhaps, but at the time the demonstration of change in the myocardium was the decisive factor in differential diagnosis.

The subsequent course of this patient indicates that the injury to his myocardium was comparatively small. He has gradually increased his physical activity until at the present time he is engaged in his usual occupation. He recently passed an insurance examination. The insurance company refused him insurance, not on the basis of the physical findings, but because of his hospital record. Figure 49 shows that subsequent electrocardiograms exhibit a progressive change toward a more nearly normal record.

Case II.—A physician, forty-seven years of age, was first seen October 12, 1925. His complaint was occasional pain, or oppression, in the left chest near the sternum. He had had this pain, on exertion, at intervals for several years. His radial arteries were barely palpable. There were no other physical findings of apparent importance. An electrocardiogram on October 13th (Fig. 50) showed T waves upright in Leads I and II, inverted and of small amplitude in Lead III. He continued his usual routine with no new symptoms. In December, 1925 he was awakened at night with pain in his chest, mostly beneath the sternum. He took several doses of codein, and finally $\frac{1}{2}$ grain of morphin. This gave only partial relief. When seen next day his temperature was 99.3° F., and the leukocytes numbered 12,000. There were no physical findings that explained his symptoms. The pain at that time was not severe. It was not influenced by nitroglycerin. After a few days he resumed his usual work, experiencing no symptoms in doing so.

He was requested to come for another electrocardiogram. This was made on March 9, 1926 (Fig. 50). This second record shows a T wave in each lead lower than that in the first record, the T wave in Lead II now being inverted.

He has had occasional slight substernal pain after exertion, and occasional symptoms referable to his gastro-intestinal tract. He is engaged in an active practice and the above symptoms occur infrequently.

In this case the diagnosis must have remained open to question had it not been for the demonstration of change in the elec-

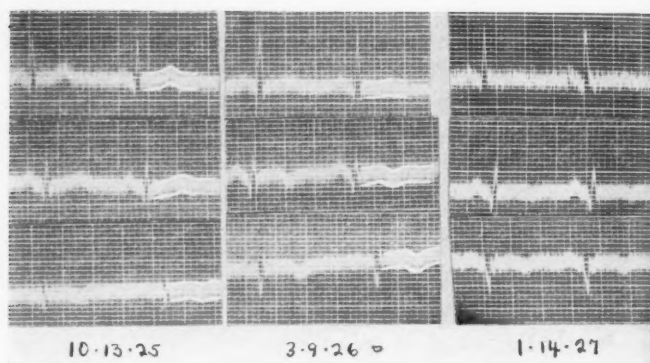


Fig. 50.—Electrocardiograms of the patient in Case II. The first is a part of the record made October 13, 1925. The second was made March 9, 1926. Note the inversion of the T wave in the second record. The last record shows less inversion.

trocardiographic record. The mere finding, after the attack, of an inverted T wave in Leads II and III, would have helped little, had it not been possible by comparison with a previous record to show that this inversion occurred (presumably) at about the time of the attack. In this case also the progressive approach of the ventricular complex toward normal, with the subsequent course and present status of the patient, leave little doubt that the myocardial lesion was of relatively slight extent.

Case III.—A woman, sixty-four years of age, was first seen March 25, 1926. Her mother died of paralysis and pneumonia. One sister died of paralysis, and a brother died of apoplexy.

For several years she had known that her blood-pressure was high, but she felt well until about the first of March, 1926. At that time she began to experience a sense of precordial oppression which would disappear on lying down. Subsequent symptoms were headache and consciousness of her heart throbbing. She was sent to the hospital April 26, 1926 for rest and for more complete examination. At that time there was a soft blowing

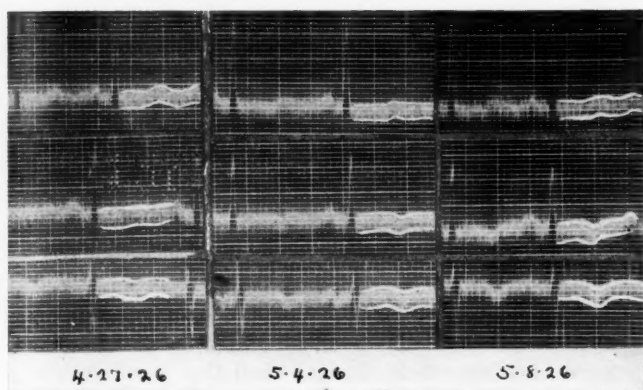


Fig. 51.—Electrocardiograms of the patient in Case III. The first shows the record of April 27, 1926, four days before her severe attack. The second shows the record of May 4, 1926. Note the lowering of the T waves

systolic murmur at the cardiac apex, and a liquid second sound. Blood-pressure was 210 systolic, 120 diastolic. There was considerable thickening of the radial and brachial arteries. The temperature was 98° F. The leukocyte count was 10,400. The electrocardiogram of April 27th (Fig. 51) showed the T wave upright in Lead I, upright, but of low amplitude in Lead II, inverted in Lead III. The diagnosis was arteriosclerosis, arteriosclerotic heart disease, and hypertension.

While at rest in bed she had occasional attacks of pain, which

she described as a "pressure" or "dull ache," in the left lower chest, extending to the left shoulder and down to the mid forearm. These attacks were not very severe, and were of rather short duration.

At 10 P. M. May 1st she had a severe attack of pain with the distribution noted above, including the left posterior portion of the neck. A "deep soreness" in the upper midsternal region persisted the following day. Previous to this the mouth temperature had varied between 97.6° and 99° , mean 98.4° F. Following this attack, for four days the extremes were 98.3° and 99.2° , mean 98.8° F. The leukocyte count on May 5th was 13,700.

The electrocardiogram of May 4th (Fig. 51) showed a lower T wave in Lead I, and an inverted T wave in Lead II. Four days later (May 8th) the T wave was still inverted in Lead II. The patient had very little discomfort after the first twenty-four hours. She left the hospital May 11th. Her activity was restricted for some months, during which time she had occasional discomfort. She is now in comparatively good health, and relatively free from pain.

Had the electrocardiographic evidence of change in the myocardium not been available, this patient's attack on May 4th might easily have been regarded as having been essentially the same as her previous attacks of pain. The change in the T wave, however, implies muscle change. And this, together with the slight leukocytosis and possibly a slight elevation of temperature in the presence of pain of characteristic distribution, makes it extremely likely that a small coronary occlusion occurred.

Without postmortem examination, a positive diagnosis of coronary occlusion in the present state of knowledge cannot be established. The diagnosis, *intra vitam*, must be only presumptive. The more serious the symptoms in a suspected case, the greater becomes the presumption. This is a general rule in medical diagnosis. As knowledge advances, the diagnosis of disease extends nearer to its beginnings and includes milder cases. The presumption appears strong that these cases are instances of coronary occlusion of different degrees of severity.

SUMMARY

More recent studies of the coronary circulation, as well as certain postmortem findings, when considered along with cases that present relatively mild symptoms of coronary occlusion, make it appear likely that thrombosis occurs in small branches, and that the damage thus produced may be, upon occasion, of rather slight extent. The grave import of such a lesion rests more, in certain cases perhaps, upon the underlying cardiac status than upon the immediate damage produced by a small lesion.

The value of electrocardiography in the diagnosis of suspected coronary occlusion depends more upon the demonstration of a coincident change in the ventricular complexes of the electrocardiogram than upon the appearance of the ventricular complex itself.

It must follow, therefore, that it is important to obtain a record which will serve as a standard for future comparison, of any patient who may exhibit signs that in any way suggest the possibility of coronary disease. It is suggested, that, by this means, considerable light may be thrown upon the question of relatively small coronary changes.

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CLINIC OF DR. DAVID BARR

BARNES HOSPITAL

THE DIAGNOSIS OF MULTIPLE LIVER ABSCESS

FROM the standpoint of infection the liver is in a particularly exposed position. Bacteria may enter it from the general circulation through the hepatic artery, or from the gastro-intestinal tract and other abdominal viscera through the portal vein. Infection can also travel from the intestines directly through the bile-ducts. Undoubtedly the invasion of the liver by bacteria is of frequent occurrence. Acute catarrhal jaundice and the infective jaundice, described by Weil, have long been known. Hepatitis, and the more severe grades of involvement, represented by abscess formation, are described in detail in the literature. These probably constitute only a small part of the infections of the liver. Mild degrees of temporary involvement are much more common than was formerly recognized. Graham has shown that a moderate degree of hepatitis exists with all gall-bladder infections. It is likely that many affections of the gastro-intestinal tract, such as colitis and mild degrees of appendicitis, give rise to a temporary hepatitis, the symptoms of which may pass entirely unrecognized. With its constant exposure, and with the many mild infections to which the liver is subject, it is perhaps surprising that serious trouble is not more often seen, and since it is relatively uncommon, one must infer that under ordinary circumstances the liver has an unusually high resistance.

In spite of its resistance, the liver under certain circumstances succumbs to infection; and liver abscess, the most serious result of bacterial invasion, is by no means a rare disease. The solitary abscess, which receives the greater attention in the literature, is almost always associated with amebic dysentery, and, except in

tropical and subtropical regions, is very rare. Multiple liver abscess, on the other hand, arises from a large number of causes, is frequently seen in all medical and surgical clinics, and may result from bacterial invasion through any of the pathways leading to the liver. Suppuration anywhere in the body may cause it. Thus it occasionally follows otitis media, mastoiditis, lung abscess, acute osteomyelitis, or septic sore throat.

It occurs more often, however, after infection of the portal vein which may, in turn, arise from a great number of conditions. Gastric ulcer, gastric cancer, non-specific intestinal ulceration, bacillary dysentery, suppuration of the mesenteric glands, and diverticulitis may be mentioned as possible although rather infrequent causes. By all means the most common etiologic factor, however, is appendicitis. Indeed, so striking was the association between the infected appendix and liver abscess in the past that the hepatic condition was called by Dieulafoy the "appendicular liver." In all of these conditions infection reaches the liver directly by way of the portal vein. This may be by means of a portal pyemia or of multiple emboli traveling from the infected focus to different parts of the liver. More frequently it arises from the condition known as pylephlebitis, a direct infection of the portal vein. In this curious affection the interior of the vein becomes actively infected, clots form and are broken down, purulent exudate fills a part of the venous channel, and in some cases the entire vein, including its intrahepatic branches, becomes one large pus pocket. A well-developed pylephlebitis, or portal pyemia, has an invariably bad prognosis.

The other frequent source of liver abscess is infective cholangitis which may be, in its early stage, a comparatively benign lesion. As long as the infection remains localized to the larger bile radicals, hope of recovery may always be entertained. If, however, it reaches the finer bile capillaries, and invades the parenchyma of the liver, it is as fatal as pylephlebitis or pyemia from the portal or general circulation. It is particularly likely to follow cholelithiasis, although it may arise from simple cholecystitis or from a severe duodenal infection.

While pylephlebitis and cholangitis are definite and separate

entities, one cannot differentiate too sharply between them. A condition starting as a pylephlebitis can involve the bile-duct in a cholangitis. Contrariwise, a cholangitis can, as in one of the patients presented today, involve the portal vein and give rise to extensive pylephlebitis. While the two conditions arise from separate causes, and often remain identical and distinct, they may in any single case be combined, a fact which gives rise to great confusion in any attempt at differential diagnosis.

The symptoms of liver abscess may be divided into three groups: A, Those referable to the original condition; B, the symptoms of a septicemic state; C, those indicating hepatic involvement. The first may be simply those of appendicitis, diverticulitis, or dysentery, of cholecystitis or gall-stones. Evidences of a septicemia are seldom lacking. Irregular temperature, often very high, frequent rigors, drenching sweats, moderate or great increases in the leukocyte count are the usual accompaniments of the well-developed case. The localizing symptoms are jaundice and enlarged or tender liver which usually appear at some time in all patients, but which may remain long latent in certain cases where pylephlebitis is the only pathologic lesion. While these symptoms present a striking clinical picture, none of them are pathognomonic, and many may be entirely absent in the individual case. With the most careful history and the most expert examination, the diagnosis of multiple liver abscesses is often in doubt. The following records represent some of the difficulties, and, unfortunately, some of the mistakes which may arise in the consideration of this quite common condition.

Case I.—Pylephlebitis with Multiple Liver Abscess Secondary to Gangrenous and Ruptured Appendix.—W. K., clerk, aged thirty-seven, entered Barnes Hospital on February 14, 1926 on the service of Dr. Ellsworth Smith. His chief complaints were of chills and fever. One night, five weeks before admission, he ate a supper containing fresh pork sausage and two glasses of home-brew. At 1 o'clock in the morning he awoke with violent abdominal pains. He took salts and castor oil which were vomited at once. A doctor, who saw him the next day, gave him medicine

and told him to go to bed. Instead he went to his work which he continued until 4 o'clock that afternoon when he had a severe chill. From that time he had, each day, at least one, and occasionally two chills which were accompanied by fever, sometimes as high as 107° F., by sweating, extreme thirst, and occasional slight abdominal pain. Examination at the time of admission revealed a patient in no apparent pain, extremely well nourished, and without the appearance of serious illness which one might expect after five weeks of chills and fever. During

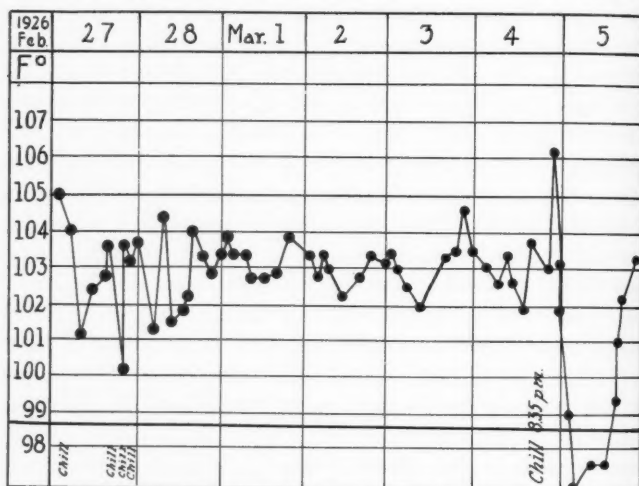


Fig. 52.—Temperature chart of Case I.

the rigors he became pallid, anxious, and was drenched with sweat. The abdomen was slightly distended, but showed no tenderness or resistance either in the right upper quadrant, in the region of the appendix, or elsewhere. The liver could not be felt, but the spleen was palpable at the costal margin. The white blood-cells numbered only 8400, 84 per cent. of them polymorphonuclears. There were 3,400,000 red blood-cells with a hemoglobin of 70 per cent. Urine was negative. Three blood-cultures were negative. A portion of the temperature chart is shown in Fig. 52.

On February 18th, the liver could be felt three finger-breadths below the costal margin; there seemed to be slight tenderness in the gall-bladder region; the spleen was found two finger-breaths below the costal margin. On the 23d, the patient admitted for the first time some pain in right upper quadrant. There was possibly a slight jaundice of the sclera, but about this there was some difference of opinion. By March 1st, the liver could no longer be felt; the spleen was still enlarged. Chills occurred irregularly. There was a period from February 27th to March 4th in which there were no rigors, but during this time the temperature remained high at 102° to 104° F. Except for this short period, chills were of daily occurrence, sometimes as many as four a day. White blood-counts were never higher than 14,000, and were usually below 10,000. In spite of the continued infection, the state of nutrition was well maintained and the patient did not seem seriously ill except during the time of rigor. On March 12th, a definite jaundice appeared; On March 22d there was diarrhea and vomiting, the pulse was small, rapid, and weak. The patient became cyanotic and died quite suddenly.

Autopsy.—There was fluid in the peritoneal cavity. Otherwise at first sight the organs of the abdomen appeared normal. The surfaces were everywhere smooth and shiny. The liver, however, was bound along its lower border to the peritoneal mesentery just below the hepatic flexure of the duodenum. There was a large tumor mass in the mesentery just below the pancreas, extending from the head of the pancreas along the mesentery to the cecum. The appendix was retrocecal and gangrenous; the gangrenous area being about 5 cm. in diameter, and extending from the point where the appendix leaves the cecum distal to that position for about 5 cm. The portal vein itself was thrombosed for a distance of about 6 cm. below its entrance to the liver. When cut across, about 250 c.c. of dirty, creamy-gray pus exuded. Pus flowed freely from all the tributaries of the portal vein below this region. Indeed, the tumor mass in the mesentery consisted of large numbers of these abscessed portal tributaries. The liver weighed 3700 grams, a huge organ, and upon section

was found to contain many abscesses, varying from a pinpoint to 10 cm. in diameter. Some were completely walled off, others showing little reaction of repair. Anaërobic streptococcus was cultured from the abscesses.

Comment.—In this case one can imagine a chronic appendicitis, probably well surrounded by firm adhesions, which on that morning of violent abdominal pain, ten weeks before his death, ruptured into a pocket already walled off from the rest of the peritoneum. The peritonitis, therefore, was narrowly localized from the start. From this abscess cavity the infection may have entered some small radicle of the mesenteric vein, thereby setting up a pylephlebitis which eventually traveled to the main portal vein, and to its ramifications in the liver. Thus the signs localizing the condition to the appendix, not recognized by the physician who first saw him, were never thereafter sufficiently striking to attract attention. It is likely that the condition became hopeless quite early, and that the infection had spread to many parts of the liver long before the patient came to the hospital. At the time he was first seen, it was apparent that the patient was suffering from a septic infection. The matter of localizing the infection to the liver, however, offered difficulty. It will be observed that for some time the liver could not be felt, that for another period, when it was palpated, it was not tender, and finally that having been felt by several observers it then became impalpable for a period of many days. Jaundice was absent at the time of admission and was definite only during the last ten days of the illness. While the diagnosis of this case presented difficulty because of the surreptitious character of the attack of appendicitis, and because of the absence of most of the usual signs of liver abscess, its general course may be taken as typical of pylephlebitis. The sign of an appendicular abscess followed by chills, fever, and sweating and the gradual deterioration of health, slowly progressive, but often lasting many weeks, corresponds to the classic descriptions found in many sources of the old literature. Fortunately, the condition was much more common in the past, when appendicitis was a comparatively unrecognized condition, than it is at present, when any pain in the abdomen

seen, was extremely irregular. The white blood-cell count was 35,000. Polymorphonuclears, 82 per cent., red blood-count 3,200,000. Hemoglobin, 60 per cent.

It was considered that the patient had chronic cholecystitis with probable multiple liver abscesses. A transfusion and large amounts of calcium lactate were given before the operation, which was performed by Dr. Evarts A. Graham on October 14th. The gall-bladder was found to be gray with thickened walls adherent to adjacent structures and containing many stones. Palpation of the common duct was almost impossible because of the obliteration of the foramen of Winslow. Palpation of the upper surface of the liver revealed several small nodules which on inspection seemed to be cream-colored and which were apparently small abscesses pointing to the surface of the liver. When these were incised, a quantity of thick creamy pus having a strong odor of colon bacillus escaped. In all, four abscesses in the liver were opened and drained. The gall-bladder was opened, and stones were removed, and drainage-tube inserted. The patient lived for ten days following operation. Some slight improvement was noted during the first week; temperature was lower, no more chills occurred. Gradually, however, she became weaker, signs of a peritonitis appeared, and she died on October 23d.

Autopsy.—An organized thrombus was found in the portal vein. There was a necrosis of the vein wall which led into a necrotic area in the wall of the hepatic bile-duct, where there was found to be lodged a large gall-stone. Throughout the liver tissue there were abscess cavities, some walled off by compressed liver cells only, some by lymphocytes, and others by considerable fibrous tissue and lymphocytes. The cavities were generally irregular in shape, some containing liquefied pus, some bile-duct epithelium. In others, the pus apparently had been squeezed out and only the cavities remained. Not all of the portal or central veins contained pus, but the larger ones were plugged. In places the exudate showed organization. The liver capsule was thickened by fibrinous exudate. The gall-bladder showed intensely vascularized mucosa with some hemorrhagic areas.

Comment.—In this patient it was apparent from the history

that there was a disease of the biliary passages, the frequent recurrence of jaundice accompanied by nausea and vomiting and pain in the right upper quadrant definitely localizing the disease. The deep jaundice, with the enlarged and tender liver at the time of observation, indicated the activity of the local process. The frequent attacks in the past, with rather definite freedom of symptoms between the attacks, suggested the possibility of a stone in the common duct. Purulent cholecystitis could not be entirely disregarded as a possibility. Since these conditions could not be excluded, an operation was justified. The anatomic lesion in this case was of particular interest. It would appear that the intermittent attacks, which the patient had previously suffered, were due to stone in the hepatic duct which had given rise to a picture not unlike the intermittent fever of Charcot, so often seen with stone in the common duct. The attacks which brought the patient to the hospital probably marked an added infection with erosion of the duct wall and the portal vein, and the onset of pylephlebitis.

Case III.—Ruptured Gall-bladder with Localized Abscess Simulating Multiple Liver Abscess.—S. O'R., a widow, aged sixty-seven, referred to hospital on January 27, 1927 by Dr. Milo Heideman. Some time in 1918 she had first noticed in the right upper quadrant mild attacks of pain which came on at intervals of two to four weeks. These were troublesome, but at first did not incapacitate her. With the passage of time they became more severe, and occasionally were accompanied by nausea and vomiting, but not by jaundice. Two days before admission she had an attack more violent than any which she had previously experienced. Pain was practically continuous. There was nausea and vomiting, and definite jaundice. At the time of admission she showed the effects of chronic illness, and was badly dehydrated. Her sclera and skin were jaundiced; her breath was foul, the tongue was dry and coated. There was marked tenderness in right hypochondrium, and the liver edge could be felt markedly tender, about 12 cm. below the costal margin in the midclavicular line. The enlargement was irregular, and

there was a suggestion that a portion of the mass was gall-bladder. White blood-cell count was 20,500; polymorphonuclears, 91 per cent.; red blood-cells numbered 4,500,000 with hemoglobin 65 per cent. The temperature was high and irregular. With forcing of fluids and general care patient became definitely better, tongue became moist, features less pinched, mass in right hypochondrium became less tender, but without decrease in size. Temperature continued irregular and white blood-cell count remained at 12,000 or above. The jaundice was less

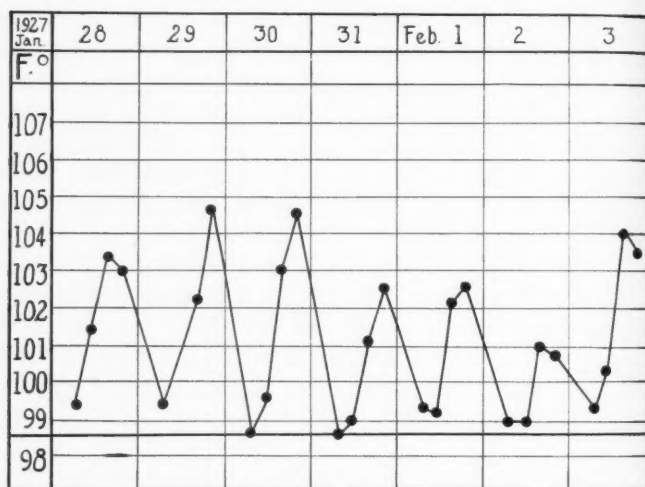


Fig. 54.—Temperature chart of Case III.

marked. On February 12th operation was performed by Dr. Evarts Graham. The gall-bladder was small, with greatly thickened fibrous walls. A stone was felt within its lumen. It was densely adherent to surrounding structures. The liver was large, greenish, but otherwise showed no abnormalities. In attempting to explore the foramen of Winslow, the finger was inserted into a large abscess cavity below the gall-bladder. About 75 c.c. of bile-stained, thick, odorless pus escaped from the abscess. A drain was inserted in the abscess cavity. Because of

the patient's poor condition, the gall-bladder was not removed, but was drained after the removal of a single large unfacetted stone. The course was stormy for about ten days following the operation. Then the temperature returned to normal and the patient recovered without unfavorable complications.

Comment.—In this case there was little doubt that the bile passages were primarily diseased. The jaundice and the long history of recurrent pain in the right upper quadrant were characteristic. The temperature reaction was that of sepsis. The liver was greatly enlarged. A diagnosis of infective cholangitis with liver abscess seemed probable. There seemed, however, a possibility that there might be a ruptured, purulent cholecystitis. This was given a certain degree of probability because of the increased size of the mass in the region of the gall-bladder. Operation was attempted not without trepidation, both because of the patient's poor condition and because of probability that the condition had gone beyond the hope of operative relief. The result of the operative procedure was in every way satisfactory.

Case IV—Ruptured Gall-bladder with Localized Abscess and Multiple Liver Abscesses Unrecognized Clinically.—E. O'B., a woman, aged fifty-two, entered Barnes Hospital on January 25, 1926, and remained until her death on April 14, 1926. Her chief complaints were of nausea and vomiting, and of swelling of the abdomen. One year before admission she noted flatulence and pain beneath the xiphoid cartilage, which radiated downward toward the umbilicus and which usually appeared one-half hour after eating. Nausea and vomiting did not occur spontaneously, but were occasionally induced to produce relief. Soda occasionally alleviated the pain. There was frequent belching of sour material. Two small blood-clots were found in the vomitus at one time. She had been chronically constipated and constipation caused increasing pain in the abdomen. The patient was badly nourished, apathetic, and exhibited the evidences of long continued illness. There was pallor of the skin and mucous membranes, the sclerae showed possibly a slight icteric tint. The tongue was coated and the breath foul. Abdomen was

markedly distended. The liver edge could be felt 6 cm. below costal margin, but a fluid wave and dulness in the flanks revealed fluid in the peritoneal cavity. There was also a slight generalized subcutaneous edema. The temperature at time of admission was constantly elevated showing an irregular course with a maximum of 102° F., occasionally becoming normal in the morning. The pulse was slightly rapid in proportion to the temperature. White blood-cell count at the time of admission was 19,875;

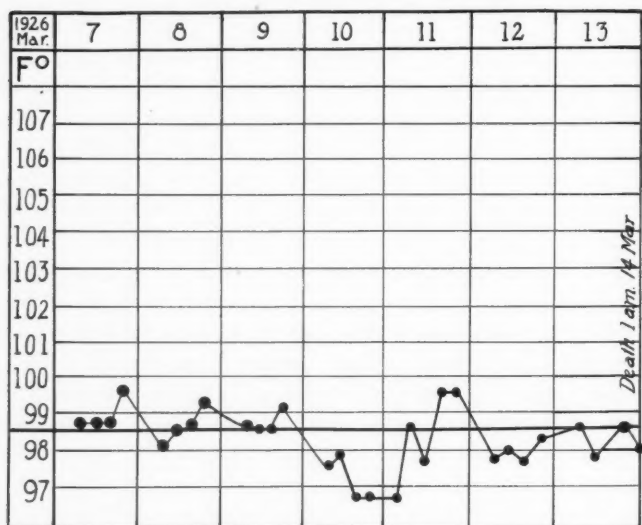


Fig. 55.—Temperature chart of Case IV.

polymorphonuclears, 83 per cent.; red blood-count was 2,140,000; hemoglobin, 25 per cent. Fluid accumulated in the abdomen during the first week of the patient's stay. On February 17th, 600 c.c. of clear, light yellow fluid were removed by paracentesis. The specific gravity was 1.013 and there were 2800 cells per c.mm., almost entirely lymphocytes. Transfusion on February 8th caused some improvement in the blood-picture.

During the next two months, the patient's condition did not change appreciably. Fluid accumulated in the abdomen; on

March 13th 5600 c.c. were removed, the blood-picture remained essentially unchanged. White blood-cells ranged between 13,000 and 21,000. Red blood-count between 3,400,000 and 3,800,000. The icteric tinge of the conjunctivæ noted on the first examination did not increase. The question of diagnosis was much in doubt. About April 7th the patient began to fail rapidly. Signs of bronchopneumonia were found and the patient, already weakened from her prolonged illness, died on the 13th with rising and irregular pulse. During her last week the temperature was normal. Immediately before her death a relative not previously questioned said, in speaking of the dying woman, that he had seen her jaundiced. This history was not remarked by the patient, nor had other relatives previously mentioned it.

Autopsy.—A low-grade peritonitis with a tremendous amount of bloody fluid was found upon opening the abdomen. An area extending from the middle of the right lobe of the liver to the region of the gall-bladder, down to the colon and across the right wall of the peritoneum had apparently separated it from the peritoneal cavity. The liver was small, weighing about 110 grams. The capsule was wrinkled and covered with a fibrino-purulent exudate. The gall-bladder was involved in a mass of adhesions and there was a large abscess in the gall-bladder region. Further examination showed that the gall-bladder was gangrenous containing a large number of stones and that the liver was studded with abscesses throughout. There was also a rather marked cirrhosis of the liver. Bacteriologic examination showed *Streptococcus hæmolyticus* and *Bacillus coli communis* in the gall-bladder, the same being present in the liver abscesses.

Comment.—Although many saw the patient, and although opinions varying from tuberculous peritonitis with cirrhosis to multiple carcinomatosis were expressed, it is not recorded that the correct diagnosis was ever mentioned by any observer. It was particularly unfortunate that the history of jaundice, apparently forgotten by the patient, was not obtained until the patient was about to die. The absence of temperature was unusual in liver abscess. The icteroid tinge of the scleræ was a matter of opinion not agreed upon by all observers. The fluid

accumulation in the abdomen, while not unusual with liver abscess, was in no way pathognomonic. While there was some tenderness throughout the abdomen, this never was localized to the region of the liver. The similarity of the lesion about the gall-bladder to that of the previous case indicates how important exploratory operation might have been at one time.

Case V.—Acute Hepatitis of Good Prognosis Mistaken for Liver Abscess.—J. J., aged twenty-nine, a patient of Dr. J. Costen, entered Barnes Hospital on November 4, 1926. She had had one child, delivered by instruments. During the end of her pregnancy she had had convulsions, and had been in labor for three or four days. A second pregnancy ended in August, 1926 in an abortion, induced by a doctor who told her she could not deliver on account of "misplaced womb." She was in a hospital, was curetted, had no complication. On November 9th, seven days before admission, patient was taken with a sore throat which developed in the course of two days into a peritonsillar abscess. On the 13th she felt restless, could not sleep, and had chills, which were followed by a period of sweating, and fever of 106 degrees. The examination revealed a well-developed, well-nourished woman, acutely ill, with flushed face, rapid respiration, hot, moist skin, and a deep and increasing jaundice. The tongue was heavily coated, the breath foul. There was a swelling of the posterior part of the soft palate, and of the pillars of the fauces. The marks of the incisions were still apparent. The left side of the neck was swollen and tender. The liver extended from the fourth intercostal space to four finger-breadths below the costal margin. It was tender, and there was also marked tenderness below the liver edge in the right upper quadrant. In the right axilla a loud, distant pleural friction rub was heard. Examination of pelvis showed a mass in the left adnexal region which was the size of an orange, moderately tender, and which, except for the signs of extreme infection, would have been considered an ovarian cyst. The temperature was elevated and irregular, showing several peaks each day, maximum 106° to 107° F., minimum, 98° F. White blood-cell count was 9000

on admission to 25,000 on November 19th. The blood-cultures were negative. It was considered that the patient probably had an acute infected process in the liver, presumably multiple abscesses, in the course of a septicemia. The prognosis was looked upon as almost hopeless, and the operation was proposed, chiefly because of the remote possibility of localized abscess or gall-bladder complication. Operation was performed on November 19th by Dr. Warren Cole. Thorough exploration was made, a simple cystic mass was found in the left ovarian region showing

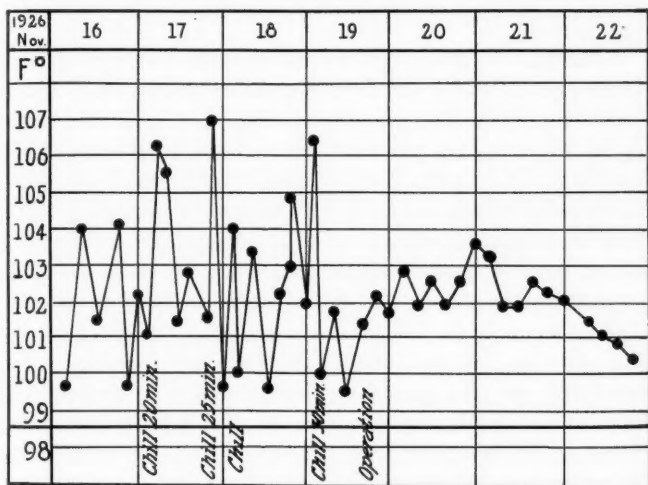


Fig. 56.—Temperature chart of Case V.

no sign of inflammation. No evidence of infection was found in the upper abdomen. The liver was greatly enlarged, was dark red, and the edges were rounded. There were no adhesions anywhere and the hand could be easily passed over the entire dome of the liver. Over the surface of the liver there were numerous small gray-white patches which might have been thought to be tiny liver abscesses, but which revealed no induration. Gall-bladder was large, and emptied with difficulty. The walls were thick and of a definitely gray color. The sentinel gland was

enlarged to the size of a lima bean. The spleen was enlarged. Before closing several small gray patches of the liver were aspirated, but no pus was obtained; a specimen was removed from the liver for diagnosis. The patient was returned to the ward in fair condition, but was considered quite hopeless. She never had another chill, her temperature reached normal in six days, and she made an uneventful recovery. The specimen of liver removed at the operation showed periportal infiltration of round cells and polymorphonuclear leukocytes, most marked around the smaller bile-ducts. Cloudy swelling was present throughout the liver parenchyma.

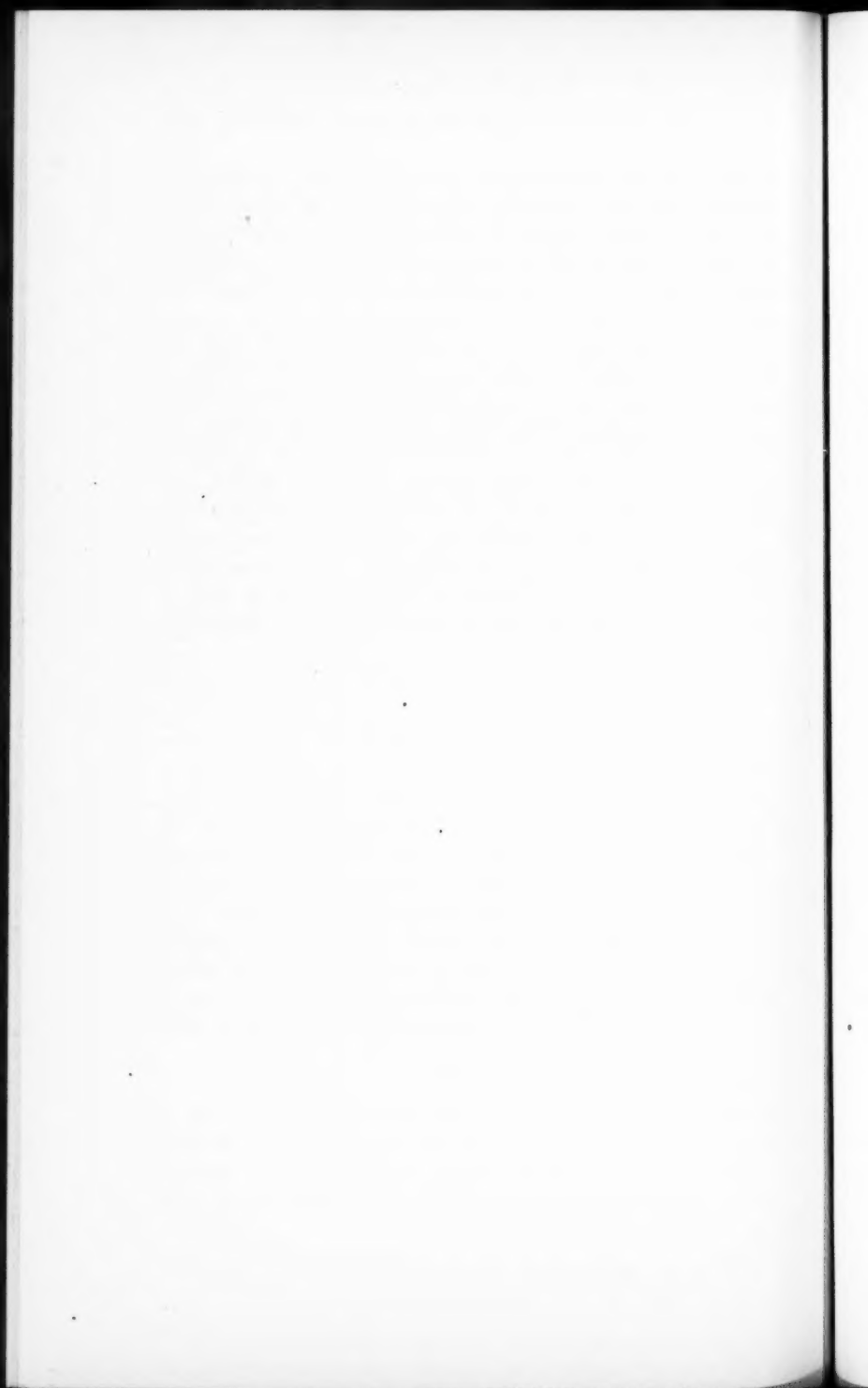
Comment.—In this patient we observed the same type of temperature as in Cases I and II, accompanied, moreover, by an intense jaundice, and a large and tender liver. All signs of an acute hepatic infection were present. The source was uncertain. The abortion had been performed fully three months before admission and the pelvic examination revealed a large and tender mass which, under the circumstances, was an object of suspicion. The throat seemed, however, more likely the source of infection inasmuch as the peritonsillar abscess had immediately preceded the illness. The friction rub in the axilla was looked upon as possible evidence of an early lung abscess complicating the tonsil operation. The picture was one of a general septicemia, in which the liver was the most obvious localization and the liver infection was considered as a metastatic abscess incidental to the general process. The patient was losing ground rapidly, her jaundice was increasing. Operation was attempted only as a forlorn hope with the possibility of finding the original focus in the pelvis or some operative localization in the lung. It accomplished no apparent purpose, but, as is seen, the recovery was rapid and uneventful and the patient has remained in excellent health.

SUMMARY

The cases which have been presented fairly represent the difficulty which is always experienced in the exact diagnosis of multiple liver abscess. Its recognition must rest upon the history of some predisposing infection of which mastoiditis, acute

appendicitis, or long-continued cholecystitis are representative examples, and upon localizing symptoms of involvement of the liver in the course of sepsis. A detailed history and a daily search for signs of slight jaundice, or for changes in the size or degree of tenderness of the liver are particularly essential in the difficult case.

Perhaps the most important lesson to be derived from the study of these patients concerns itself with the advisability of exploratory operation. Liver abscess, quite hopeless itself, cannot be accurately differentiated from a number of other diseases of the bile passages. Among these may be mentioned empyema of the gall-bladder, rupture of the gall-bladder, and stone in the common bile-duct or in the hepatic duct associated with cholangitis. These conditions are often remediable by operation, and the possibility of finding them, even in cases where liver abscess seems most probable, should always be kept in mind whenever the question of operation is to be considered.



CLINIC OF DR. WALTER BAUMGARTEN

FROM THE MEDICAL SERVICE, ST. LUKE'S HOSPITAL

THE RELATIONSHIP BETWEEN CHOLECYSTITIS AND THE PERSISTENCE OF DUODENAL ULCER

A GROUP of cases of duodenal ulcer have come under observation, which, in spite of careful dietetic and hygienic treatment, have repeatedly improved up to a certain point and then relapsed. In spite of care on the part of the patient as well as of the physician, a marked instability in results has existed over a prolonged period. Some of these patients have had histories of disability, and have been under observation over a number of years.

Recently, on re-examination of such patients from every point of view, cholecystograms were made as well as the usual gastro-intestinal *x*-ray and other gastric and abdominal examinations. The results are sufficiently striking to warrant the presentation of the following records:

Case I.—T. J. F., male, aged twenty-two, single, clerk, weighing 129 pounds, came under observation June 20, 1925 because of pain in epigastrium, occurring about an hour before meals and relieved by eating. Onset had occurred three and a half years ago. Improvement followed an appropriate diet one and a half years ago, but pains returned on slight provocation. Bowels are constipated. No record of nausea or vomiting. Family history is negative. Previous history is unimportant and gives no record of infections, except mumps and measles in childhood. The patient smokes three to four cigars a day, takes alcohol occasionally, and coffee daily. Physical examination is essentially negative; the abdomen is flat, slightly rigid in the right epigas-

trium, but the edge of the liver is palpable at the costal margin, thin and not tender. The urine was normal—leukocytes 9200. Gastric analysis showed, on fasting stomach, total acidity 67, and free hydrochloric acid 51; after a test-meal, total acidity 92, free hydrochloric acid 56. Stool negative for occult blood. A tentative diagnosis of duodenal ulcer and constipation was made. On an appropriate diet the symptoms subsided, but reappeared on the slightest deviation from it. Because of this, a gastro-intestinal x-ray was made at St. Luke's Hospital September 10, 1925, which substantiated the clinical diagnosis. No appendix tenderness was found. Because of the absence of permanent result after persistent care in diet, a cholecystogram was made (intravenous injection of dye) December 19, 1925. This demonstrated a pericholecystitis. Repetition of the cholecystogram, March 5 1926, confirmed the original finding. Cholecystectomy and appendectomy, by Dr. M. B. Clopton on March 10, 1926 showed wide-spread, dense adhesions to the liver and duodenum. The cystic duct appeared to be reduced to a firm fibrous band. An ulcer scar, 1 cm. in diameter, was found on the anterior surface of the first portion of the duodenum, not surrounded by adhesions. The appendix showed an old chronic inflammation with constriction at the base.

An uninterrupted recovery followed. Ulcer diet was continued for six months after operation, and since then restriction in sugar, coffee, and tobacco. No further symptoms have occurred. No occult blood in the stools.

Case II.—J. R. G., male, sixty-seven, has been under observation by others as well as myself for many years. For the past five years (1922) he has had a careful and persistent ulcer diet, the x-ray diagnosis of ulcer having been made by Dr. R. Walter Mills. On August 1, 1926 he again came under my personal observation with reappearance of ulcer pains. On August 9 a complete gastro-intestinal review was undertaken, this time with the addition of a cholecystogram (intravenous dye) to the gastro-intestinal x-ray study. The gall-bladder was not visualized and no obvious stones could be demonstrated, so

that the conclusion of cystic duct occlusion was reached. The old duodenal ulcer was visualized. Gastric analysis August 12 showed total acidity 109, free hydrochloric acid 98.

Cholecystectomy and appendectomy on August 28, 1926, by Dr. M. B. Clopton, showed a thickened, hard liver, dense adhesions of the gall-bladder to the omentum, the gall-bladder thick and edematous and closely adherent to the second portion of the duodenum, and containing a single irregular stone. The omentum was densely adherent to the first part of the duodenum as if protecting a perforated ulcer; this was left undisturbed. The appendix was long and thick, apparently not greatly diseased. Microscopic examination of the gall-bladder showed a much thickened wall with considerable irregularity in size and shape of the glands, and many widely scattered masses of lymphocytes.

A stormy surgical convalescence was followed by progressive recession of ulcer symptoms until, in December, 1926, no trace of pain remained. On a liberal diet since January 14, 1927. Occult blood still present. No repetition of gastric test-meal.

Case III.—J. W. B., male, aged thirty-one, came under observation in 1921 with severe gastric and intestinal hemorrhage, following ulcer symptoms, several years in duration. After a safe interval of treatment a gastro-intestinal x-ray study revealed a duodenal ulcer. Symptoms disappeared on a rigid diet, but reappeared on the slightest deviation. The intervening years have presented a series of ups and downs, during most of which the patient was not under close observation or control. At various times occult blood was found in the stools. A normal weight of about 160 pounds was well maintained.

On February 2, 1927 a cholecystogram and gastro-intestinal x-ray showed a functionally impaired gall-bladder, which was slow to fill and lacking in concentrating power. No stones were found. An inactive duodenal ulcer was demonstrated.

Cholecystectomy and appendectomy on February 17, 1927, by Dr. O. R. Sevin, showed a thickened gall-bladder with adhesions to the omentum and cystic duct. A white scar was

found on the anterior surface of the duodenum 1 cm. distal to the pyloric vein. Old adhesions were found in the abdomen retroceally placed to the appendix. Gall-bladder and appendix were removed. On microscopic examination the gall-bladder showed a slight increase in connective tissue in the wall, especially to the outer side, and was infiltrated with lymphocytes. In many places in the lymph-spaces of the muscle wall polymorphonuclear leukocytes, plasma-cells, and lymphocytes are found. The appendix showed extensive lymphoid hyperplasia with an increase in connective tissue in the mucosa.

Operation was followed by uneventful convalescence and entire disappearance of digestive disturbance.

Re-examination by *x-ray* on March 3d showed the shallow duodenal ulcer unchanged, but without tenderness or hyperirritability. No gastric analysis was done at this time.

Case IV (incomplete).—W. M. H., female, sixty-eight, has had digestive disturbances for the past six years. Diagnosis of duodenal ulcer made one year ago. Diet has accomplished only temporary improvement, which disappeared on very slight deviation. The patient came under my personal observation on January 8, 1927. Re-examination, with the addition of a cholecystogram, on January 10th, showed a faint gall-bladder shadow, which failed to concentrate or to vary in size, together with negative stones. Gastro-intestinal *x-ray* showed a shallow duodenal ulcer. Gastric analysis showed total acidity 25, free hydrochloric acid, 15. Occult blood questionable.

Because of the patient's age, an existing cardiovascular hypertension of considerable degree, and the absence of imperative signs, cholecystectomy has been postponed.

It seems to be a fair conclusion, from the sequence of events in the cases cited, that with the removal of the pathologic gall-bladder the factor has been eliminated which maintained the activity of the duodenal ulcer, and prevented its healing.

Recent studies in the distribution of the lymphatic connections between the liver, gall-bladder, duodenum, and pancreas

suggest the explanation of the results obtained in such cases by removal of the infected gall-bladder.

Sudler¹ in 1901 described the distribution of lymphatics from the gall-bladder to the liver on the one hand, and along the biliary ducts to the pancreas and lower duodenum on the other. Cuneo² in 1904 called attention to the intimate relations between the lymphatics of the terminal segment of the common bile-duct and the lymphatics of the duodenum and the head of the pancreas. More recently Deaver,³ Judd,⁴ MacCarty and Jackson,⁵ and especially Graham, Peterman, and Priest,^{6, 7} have made surgical and experimental studies on the lymphatic origin of cholecystitis, choledochitis, and the associated pancreatitis. In a recent article Kodama,⁸ at the suggestion of Graham, has shown, by the experimental injection of the subserosal lymphatics of the gall-bladder in the dog, that there is a direct connection between these lymphatics and those of the first portion of the duodenum, as well as with the lymphatic glands surrounding the portal vein, the lymphatics of the pancreas, and the lymphatics of the second and third portions of the duodenum. He has also shown that phenoltetrachlorophthalein is excreted through the wall of the duodenum and the jejunum.

In view of these findings it is important to emphasize that a duodenal ulcer, which does not get well after prolonged and appropriate treatment, should be re-examined with reference to the possibility of a coincident cholecystitis. Much greater accuracy in the determination of this condition has been made possible by the method of cholecystography by means of the intravenous injection of sodium tetraiodophenolphthalein. Undoubtedly, many such interrelated infections of the gall-bladder and co-existing duodenal ulcers are being overlooked.

A cholecystogram should, therefore, become a part of the usual routine of the gastro-intestinal x-ray examination. The fact should likewise be recognized that the findings of cholecystography often explain digestive disturbances, not satisfactorily solved by gastro-intestinal x-ray examinations conducted without this added measure.

(I wish to express my indebtedness to Dr. Oscar Zink, radi-

ologist, St. Luke's Hospital, for his invaluable roentgenologic study of the cases reported.)

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CLINIC OF DR. J. CURTIS LYTER

ST. ANTHONY'S HOSPITAL

CHYLOUS ASCITES AND CHYLOTHORAX

ON May 1, 1926 there was sent to the medical service of St. Anthony's Hospital a male patient aged thirty-seven years, by occupation a farmer. His family history was of no interest. In his past personal history we find that he had a herniotomy and the removal of the right testicle, which was enlarged, in May, 1925. His history elicited the fact that in May, 1924 he noticed an epigastric fulness with some eructations following meals. Associated with this there was a dull pain in the epigastrium, and some tenderness in the umbilical region. These symptoms also appeared immediately following meals. In May, 1925 a gradual and progressive enlargement of the abdomen developed. In November, 1925 he noticed a swelling of the ankles, limbs, and the external genitalia. Shortly following the onset of this swelling there also developed an edema of the right hand. Beginning three months before his entrance into the hospital there developed a dyspnea and orthopnea which have become very profound. Associated with the dyspnea there was some cough with a yellow sputum, but no pulmonary hemorrhages. Two months before entering the hospital he noticed some vomiting. One day vomiting occurred five times and the color of the vomitus was milky. This vomiting was not present during the last month previous to his entrance into the hospital. Upon his entrance his main symptoms were unproductive cough, profound dyspnea, orthopnea, a marked distention of the abdomen, and marked swelling of the external genitalia, limbs, and feet.

A physical examination conducted upon his entrance into the hospital revealed all of the classic signs of a left pleural effusion

with the heart being displaced to the right; the right margin of the heart was in the right midclavicular line at the fourth interspace. The abdomen was markedly distended, and revealed the presence of a large ascites. There was a very profound edema of the subcutaneous tissues over practically the entire chest, throughout the right arm and hand, over the lumbar region, the external genitalia, and the limbs and feet. His blood-pressure was systolic 100, diastolic 65.

At that time it was considered that the patient had a very large left pleural effusion and a very marked abdominal ascites. Upon aspirating the left chest on May 2d there was obtained 1000 c.c. of milky fluid. On May 3d, 600 c.c. was again obtained. On May 4th another 600 c.c. was removed and on May 5th 1000 c.c. On May 7th, 1100 c.c. were removed. On May 10th, 1600 c.c. of the milky fluid was again removed from the left pleural cavity. In other words 5900 c.c. of fluid was removed in ten days. It seemed that the fluid would re-accumulate in the pleural cavity as rapidly as it was withdrawn. On May 10th 2000 c.c. of milky fluid was aspirated from the abdomen. Following the abdominal aspiration the examination of the abdomen revealed a large tumor mass lying in the epigastrium. This mass was very firm, slightly nodular, and fixed in position. It did not move with respiration. It occupied the entire epigastrium, and extended well into each hypochondrium and into the umbilical region. There was very little tenderness upon pressure over the mass. At this time a fluoroscopic examination of the chest revealed the heart and mediastinum pushed far to the right, and a fluid occupying most of the left thoracic cavity. A trophoscopic examination of the colon revealed the hepatic flexure, and the transverse colon lying in the right iliac region and in the pelvis, apparently pushed downward by the tumor mass described. There were no filling defects or other abnormalities to be found in the colon. The stomach under the barium-meal could be observed to lie transversely, but was apparently pushed well to the left and upward. The stomach was freely movable, and there was no evidence of filling defects, incisura, niche, or buds. The duodenum was visualized well throughout

and made a very large loop, indicating probably the presence of a tumor mass in the loop of the duodenum.

The examination of the urine revealed a trace of albumin, a moderate number of hyaline and granular casts, and 45 per cent. of P. S. P. during the first two hours after its intravenous injection. The blood revealed a hemoglobin of 90 per cent.; red cells 4,480,000; a color index above 1; the leukocytes, 4600, of which 84 per cent. were polymorphonuclears, 10 per cent. large lymphocytes, and 6 per cent. small lymphocytes. There were 54 mg. of non-protein nitrogen; 100 mg. of sugar; 1.2 mg. of creatinin, and 3.2 mg. of uric acid per 100 c.c. of blood. The Wassermann and Kahn reactions for syphilis were negative. The laboratory report upon the milky effusion removed from the chest as well as from the abdomen was as follows: Fluid markedly opaque, milky white; no odor; watery consistency; reaction alkaline; albumin content 1 per cent.; total solids 3.7 per cent.; fat content 4 per cent. A smear stained by Wright's stain revealed the following cytologic picture: Polymorphonuclear leukocytes, 45 per cent.; large lymphocytes, 13 per cent.; small lymphocytes, 42 per cent. Upon permitting the fluid to stand for a while a very thick layer of cream rose to the top. The microscopic examination of a smear revealed many fat droplets.

At this time a clinical diagnosis of a malignancy of the retroperitoneal lymph-glands in the region of the cisterna chyli was made. It was thought that probably the primary site of the malignancy was in an unrecognized malignant testicle which had been removed one year previously. It was also thought that the tumor mass had so involved the cisterna chyli as to produce an obstruction of the lymphatic vessels from the peritoneum and probably from the stomach since the patient gave a history of vomiting a chylous fluid. It was also thought that probably the tumor had involved the lymph-glands of the posterior mediastinum, and caused an obstruction of the thoracic duct with a chylous effusion in the left pleural cavity.

The patient died on May 25th, a little more than three weeks after he entered the hospital. An autopsy was procured and there was found upon opening the abdomen a very large mass, 12

inches in the transverse diameter, 10 inches in the longitudinal diameter, and 4 inches in the anteroposterior diameter; lying in the epigastric region densely adhered to the posterior abdominal wall and the spine. Overlying the mass were numerous coils of small intestine which were densely adhered; the pancreas lay across its upper portion and was densely adhered. The stomach and transverse colon were not adhered to the mass. The liver, spleen, and kidneys were grossly negative. The mass apparently extended through the aortic opening of the diaphragm and there were numerous small masses in the posterior mediastinum. It was impossible to define the origin of the mass in the abdomen, but since all of the other organs were apparently free, we assumed that the mass arose in the retroperitoneal lymph-glands. The pathologist's report of the mass was carcinoma.

In this case we have all of the features which are ordinarily considered essential to render a positive diagnosis of chylous ascites and chylothorax. In the first place, there was a pathologic condition capable of obstructing the abdominal and thoracic lymph-trunks. Associated with this was a milky effusion, which accumulated very rapidly and which contained a large quantity of fat. The fat was recognizable upon microscopic examination and upon chemical examination. That the gastric lymph-vessels were also obstructed is probable from the history of milky vomiting. Insofar as I am able to elicit from a study of the literature, this is the only case on record where vomiting was apparently associated with a large quantity of chylous material.

Shaw has listed all of the cases described, up to and including 1900, and has classified them according to the nature of the effusion as follows:

1. Ascites:

(a) Chylous:

- | | |
|--|----|
| 1. Compression of thoracic duct or lymphatic vessels by glands, neoplasms, etc. | 18 |
| 2. Non-tuberculous peritonitis, constricting lymphatic vessels | 9 |
| 3. Blockage of left subclavian veins. | 6 |
| 4. Carcinoma of the peritoneum, constricting lymph-vessels. | 5 |
| 5. Parasites. | 3 |
| 6. Obstruction of thoracic duct. | 5 |
| 7. Obstruction of lymph glands. | 3 |

8. Obstruction of the lymph-vessels.....	2
9. Strain, cough, etc.....	5
10. External violence.....	3
11. Malignant lymphoma.....	3
12. Disease of liver.....	2
13. Syphilis.....	2
14. Primary disease of lymph-vessels (angioma).....	1
15. Stone in receptaculum chyli.....	1
	<hr/> 68

(b) Chyliform:

1. Tuberculosis of peritoneum and glands.....	6
2. Carcinoma of peritoneum, lymphatics, and stomach.....	6
3. Cirrhosis of liver.....	3
4. Cardiac affections.....	2
5. Sarcoma of omentum, mesentery, etc.....	3
6. Chronic (non-tuberculous) peritonitis.....	1
7. Primary fatty degeneration of peritoneal epithelioma.....	1
8. Lipemia.....	1
9. Mixed forms:	
Carcinoma of the peritoneum, mesentery, etc.....	3
Tuberculous peritonitis.....	1
	<hr/> 27

(c) Lactescent non-chylous ascites..... 1

2. Hydrothorax:

(a) Chylous:

1. External violence.....	9
2. Carcinoma of the pleura.....	5
3. Blockage of left subclavian vein.....	4
4. Compression of duct by tumors.....	4
5. Malignant lymphoma.....	2
6. Diseases of lymphatic vessels.....	2
7. Obliteration of thoracic duct.....	1
8. Parasites.....	1
9. Doubtful cause.....	3
	<hr/> 31

(b) Chyliform:

1. Carcinoma of pleura and lymph-vessels.....	3
2. Tuberculous pleurisy.....	5
3. Non-tuberculous pleurisy.....	3
4. Lung abscess.....	1
5. Lipemia.....	1
	<hr/> 13

Thus of the 54 cases of milky fluid in the chest 31 were apparently chylous, 13 chyliform, and 10 were doubtful. Forty-four of these cases occurred in males and 13 in females. The

largest amount of fluid recovered from the chest in any 1 case was 30 liters by 8 punctures. Shaw calls attention to the fact that there is frequently great difficulty in deciding whether an effusion is chylous or chyloform. The mere presence of a large amount of fat is not sufficient to distinguish between the two types of effusion, but if with this an obstruction can be demonstrated in the large lymph-ducts or their branches the fluid may be considered chylous, though an actual rupture may not be found in the lymph-trunk. Chyloform fluid is a milky fluid occurring as a morbid product, and unattended by any blockage or distention of the lymphatic vessels. Shaw felt that it was impossible to decide whether an effusion is chylous or chyloform merely by the chemical analysis of the fluid. He felt that not only should the chylous nature of the fluid be demonstrated, but the actual lesion must be shown to obstruct the lymphatic trunks, since some fluids, very similar to chyle in composition, occur quite apart from any obstruction of the thoracic duct or the lymph-vessels so far as can be seen, and depend really upon inflammatory processes, tumors, etc. which do not involve the lymph-ducts or their branches.

Lewin states that chylothorax is a condition which may be due to the rupture of the thoracic ducts or its radicles, or to some pathologic process in their walls whereby the contents may be transuded into the pleural cavity. In 1899 Handman collected only 41 cases in reviewing the literature of two hundred sixty-one years. In 1908, Baldwin increased this number to 47. In 1912, Sale added an additional case which was thoroughly studied. In 1913, De Lange and Grunder each reported 1 case, making in all, with Lewin's case, 51 cases. Lewin concluded that the diagnosis could only be made with the aid of the exploring needle, or by postmortem examination. He thought that chyle differed from ordinary lymph in that it contained a larger percentage of fat; while in exceptional cases chyle contains a larger percentage of sugar than does lymph. Chyle differs from serum in two important particulars according to Lewin. It contains a larger percentage of fat, but smaller percentage of protein than does blood-serum. The amount of urea in chyle is greater than

in blood. The soaps amount to 0.2 per cent. The fat in chyle is almost entirely in the form of neutral fats. The normal flow of lymph from the thoracic duct per hour is estimated to be about 130 to 195 c.c. Any retardation or obstacle to the current of blood in the right subclavian vein either from diminution of its lumen, or some regurgitating heart affections must hinder the movement of the chyle in the duct and its trunks. The intact pleura is permeable to chyle according to Lewin.

Outland and Clendening discussed chylous ascites and chylothorax due to carcinoma of the stomach, reporting a case, studied at necropsy, in which it was believed that the chyle escaped into the abdomen through the small lymph-vessels of the intestine and mesentery as these vessels were so much dilated. The fluid recovered from the chest and abdomen gave what they considered as evidence of true chyle. They state that the differences between chylous and pseudochylous or chyliform fluids, as emphasized by some writers, are as follows:

1. True chylous effusion is due to the presence of chyle.
2. Chyliform or fatty, though resembling true chyle, owes its milky appearance to emulsified fat, the result of a morbid degeneration of cellular elements.
3. In a third type the opacity is not due to the presence of fatty emulsion, but is caused by the presence of opalescent substances, the exact nature of which is still undetermined.

While the patient had chylothorax they were unable to recognize the thoracic duct at autopsy.

Upon reviewing the literature one is convinced that for many years it has been agreed that all opaque white fluids from the serous cavities are not necessarily due to admixture with chyle. It has been found that although a certain fluid contained fat, no lesion could be demonstrated which would permit the escape of chyle. It has also been decided that the opacity of certain fluids may be due to some substance other than free fat, though fat might also be present. There have been three different types of fluid described: Chylous, due to thoracic duct chyle; chyliform, in which the fat appears to be due to cell degeneration; the pseudo-chylous, in which the opacity is greatly or entirely due to other

substances than to fat. An objection to this grouping is the difficulty in differentiating satisfactorily the two varieties of fatty fluid. In recent years this classification has undergone some revisions. A few clinicians, among them being Gandin, assume that all opaque white fluids from the abdomen or thorax are caused by chylous admixture. Most students believe, apparently, that two types of fluid are well differentiated: Chylous, in which the fluid is adulterated with chyle; the pseudochylous, in which may be contained emulsified fat, but in which the opacity is due largely to lecithin in some unexplained combination with globulin. One must remember, however, that a solution of the difficulty is not possible in all cases without a thorough knowledge of the condition present and a complete chemical analysis of the fluid. It would appear that most clinicians after having reviewed the subject have come to believe that the distinctive features of the two varieties of effusion are: The presence or absence of fine, highly refractile granules which do not take fat stains; the amount of fat; the amount of lecithin and of globulin; the rate of accumulation of the fluid, and, above all, the demonstration of a pathologic lesion capable of interfering with the normal physiology of the great lymphatic trunks. In some cases it is impossible, purely from a chemical examination to determine whether an effusion is chylous or pseudochylous. The determination of that point apparently rests upon the demonstration of a pathologic lesion capable of disorganizing the circulation of lymph in the large trunks.

In the case which has been delineated above, there is no question about the existence of a pathologic lesion capable of disorganizing the lymphatic circulation in both the abdomen and the chest. There can be little doubt, then, that we have reviewed a case of true chylous ascites and chylothorax. The most distinguishing features of this case were the very rapid accumulation of the effusion in both the chest and the abdomen, the very large quantity of fat demonstrable in the effusion, the heavy cream layer which rose to the top of the effusion when it was permitted to remain quiet for a while, and, at autopsy, the demonstration of a pathologic process having its origin apparently in the lymph-glands around the cisterna chyli.

CLINIC OF DR. ARTHUR E. STRAUSS

FROM THE HEART CLINIC OF WASHINGTON UNIVERSITY DISPENSARY,
THE BARNES HOSPITAL, AND THE DEPARTMENT OF INTERNAL
MEDICINE OF WASHINGTON UNIVERSITY

HEART-BLOCK, AURICULAR FLUTTER, AND ADENOMA OF THE THYROID

THE unusual association of conditions met with in this case seem to justify its presentation, both from the viewpoint of the case itself and from the lessons that may be learned therefrom. As has already been noted from the title, this patient has been the subject of complete heart-block, at one time associated with auricular flutter, and of an adenoma of the thyroid which passed from a state of inactivity or hypothyroidism through the stage of hyperthyroidism, with relief by operation.

It will be of greater interest to present this patient as she appeared through the twelve years of observation, the last eight of which have been under my personal care, and discuss the problems that arose from time to time, rather than to give the complete history at once.

Mrs. E. P. was thirty-nine years of age when she first entered the Washington University Dispensary in 1915 because of nervousness and "swelling in the neck," which had been noticed about five years previously. The family history was irrelevant, as were the personal habits of the patient. The past history likewise was unimportant, the only previous diseases having been measles, pertussis, bronchitis, tonsillitis, probable anterior poliomyelitis in infancy, malaria, and a vaginal abscess three years before. Eight years ago, after the birth of her only child, she had numerous fainting spells, but none since. She has had hemorrhoids with blood and mucus in the stool for several

years. There was no history of rheumatic fever, chorea, diphtheria, or syphilis. The patient was carefully studied at that time in the Washington University Dispensary and in Barnes Hospital, the significant findings being enlargement of the left lobe, and isthmus of the thyroid ("size of a walnut"), moderate cardiac enlargement with a systolic murmur at the apex, and a regular heart rate of 40 to the minute. The patient stated that she has had a slow pulse for the past twenty years, having been rejected for life insurance at that time, and being told that the heart was only half as fast as it should be. Heart-block was suspected because of the slow rate, and was confirmed by the find-

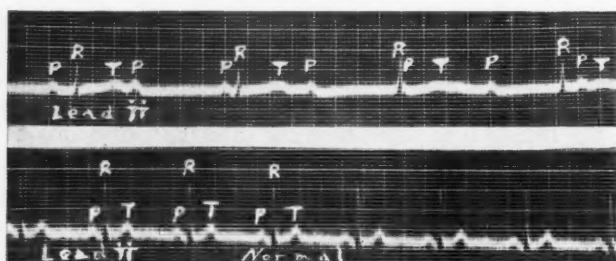


Fig. 57.—(E. K. G., 3132—Lead II, November 19, 1919.) Showing complete heart-block. Auricular rate 75, ventricular rate 41. Note the complete absence of relationship between auricular activity (P) and ventricular activity (R). A normal electrocardiogram is shown below to illustrate the normal relations of auricles and ventricles.

ing of extra "a" waves in the jugular vein during ventricular diastole, and by electrocardiographic study. The arteries were normal and the blood-pressure varied from 135/70 to 96/60. The urine and blood-pictures were normal. The blood Wassermann was negative and frequent subsequent tests have been negative. The stool showed blood and mucus.

The patient's condition remained practically stationary until 1918, at which time the hemorrhoids were so troublesome that operation was advised. Under ether anesthesia the usual hemorrhoid operation was performed, there being some acceleration of the pulse during the anesthesia, but no other disturbance of

the circulation. In 1920 a stricture of the rectum had developed at the site of the previous operation, due to cicatricial contraction. Again under ether the stricture was dilated, and the operative note states that the anesthetic was well taken. I mention these operations because of the bearing upon our later decisions in the treatment of the patient. The electrocardiograms during all this period of observation continued to show the typical complete heart-block (Fig. 57).

In 1921 the gynecologic department asked for an opinion as to whether an operation for repair of the pelvic floor was advisable in view of the heart condition. I shall report my answer as written at the time: "If operation is necessary I believe it may be done with safety as far as the heart is concerned. Patient has already had several operations since the heart-block was discovered, and has done well in each. The myocardium is apparently fairly good. However, the patient is very neurotic and unless the operation gives good promise of marked relief from the symptoms, I do not believe I should urge it, especially if patient objects." The operation was not performed.

Again, in 1923, the gynecologic department asked for an opinion on the advisability of operation for a cystocele and rectocele which were giving rise to some symptoms, and my answer was, "In view of the multiplicity of symptoms and pathologic conditions, in addition to the rectocele and cystocele together with the complete heart-block, I believe that operation would be inadvisable unless an absolute necessity, in which case it might be done." In explanation of this opinion it should be said that the patient was then complaining of symptoms referable to the menopause, of rectal discomfort due to a proctitis, of vague gastro-intestinal disturbances, etc. No operation was done.

In 1924 another problem presented itself. The thyroid, which had previously given rise to no concern, seemed to be growing and the patient had gained about 30 pounds in weight in the preceding eighteen months. A basal metabolism test made at that time (November 14, 1924) showed -16 per cent. The patient was accordingly placed on thyroid extract gr. ss t. i. d., and later raised to gr. j t. i. d. During all this time (November 14,

1924 to April 14, 1925), the heart-rate varied from 40 to 34 per minute. On the latter date the basal rate was +5 per cent., there having been no thyroid taken for three days preceding the test, and in view of the test it was permanently discontinued.

There had been a loss of weight of 7 pounds during the five months of thyroid administration, and the patient felt generally better. There was no tremor of the extended fingers at that time. By November, 1925, with no thyroid having been administered for seven months, there were increasing signs of hyperthyroidism and the metabolism test was +32 per cent. Lugol's solution gtt. v t. i. d. was begun at that time, and continued in doses up to gtt. x t. i. d. till February 19, 1926. On this date an electrocardiogram showed the presence of auricular

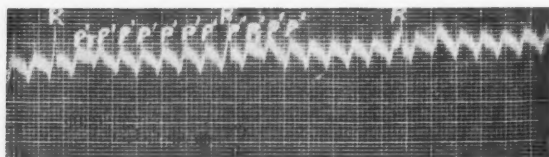


Fig. 58.—(E. K. G., 15,353—Lead II, February 1, 1926.) Showing complete heart-block with auricular flutter. Auricular rate 340, ventricular rate 42. First electrocardiogram showing auricular flutter with complete heart-block.

flutter with continuation of the complete heart-block, the auricular rate being 340, the ventricular 42 (Fig. 58). How long the auricular flutter had been present was not known, as it was not noted clinically until after the electrocardiogram disclosed it. However, after knowing of its presence, it could be recognized clinically by a replacement of the relatively large and infrequent "a" waves in the jugular vein by a rapid small undulatory movement, and fluoroscopic examination of the heart showed a rapid auricular action appearing like a fluorescence along the auricular margin, with a slow, forcible action of the ventricles. The auricular flutter continued as a permanent manifestation, being present at frequent clinical examinations, and confirmed repeatedly by electrocardiograms.

Although the auricular flutter did not disturb the circulation,

because of the check by the complete heart-block, it was deemed advisable to try to change the flutter back to normal mechanism. There are two recognized methods for bringing this about, *i. e.*, the use of (1) quinidin, or (2) digitalis. Accordingly I began the administration of quinidin sulphate on May 4, 1926, the flutter then having been known to be present continuously for more than ten weeks. As is the custom, I began with the test dose of $2\frac{1}{2}$ grains, followed in two hours by 5 grains to test for idiosyncrasy. As you know, the usual toxic manifestations of quinidin are diarrhea, nausea and vomiting, tinnitus, weakness, faintness or actual fainting, and headache. The patient, having been warned of these symptoms, and developing a diarrhea after



Fig. 59.—(E. K. G., 15,760—Lead II, May 6, 1926.) Showing complete heart-block with auricular flutter. Taken after quinidin sulphate, gr. v t. i. d., had been administered for two days. Auricular rate 278, ventricular rate 47. Note.—Auricular rate before beginning quinidin was 335 to 350. Compare with Fig. 58.

$7\frac{1}{2}$ grains, stopped the medicine. However, the diarrhea promptly subsided, so I again prescribed gr. v t. i. d., using this smaller dose, rather than the usual and more effective dose of gr. x t. i. d., because of the readiness with which diarrhea was produced in this patient. Despite some diarrhea I continued this dose for four days, but at the end of this time, when a total of $67\frac{1}{2}$ grains had been taken, the drug was discontinued because of increasing diarrhea, nausea, and weakness. The quinidin caused some slowing of the flutter rate, but did not cause reversion to the normal auricular mechanism (Fig. 59). The diarrhea continued for nine days after the quinidin was stopped, indicating that the attempt to force quinidin after the development of the diarrhea was ill-advised.

Digitalis acts, in more than 50 per cent. of the cases of auricular flutter, by causing a change to auricular fibrillation.

at which stage the digitalis is discontinued, and many of the cases then spontaneously revert from fibrillation to normal mechanism. Digitalis was accordingly tried in this case after the failure of quinidin. In doses of 25 to 20 drops (*not* minims), t. i. d. tincture of digitalis was given, for a total dosage of 20 c.c. in thirteen days, without effect on the flutter, so it, too, was discontinued. It should be noted here that, with the patient under constant observation for twelve years, digitalis was not given except as just mentioned (and, when first seen, to test its action on the heart-block). This point is worthy of some emphasis, because there is a great tendency in some quarters to prescribe digitalis immediately upon making a diagnosis of heart disease, regardless of the indication. Digitalis was not withheld in this case because of the presence of heart-block, because it can be given with impunity where there is complete heart-block, but it was not ordered because there was no indication for its use, except as just noted.

The basal metabolism had risen to +43 per cent. on March 17, 1926, and +45 per cent. on July 2, 1926, with a further loss of 7 pounds since the previous November. The heart rate was still 40 to 35 (ventricular) and the auricular flutter continued at a rate of 320 to 240. At this time a note was made on the clinical record to consider a thyroid operation in the Fall. However, a further complication arose in the occurrence of an attack of acute cholecystitis for which the patient entered the hospital on September 10, 1926. The symptoms at this time were pain in the right upper quadrant of the abdomen with nausea and vomiting. There was some fever, a leukocytosis of 16,000, slight icterus, and tenderness in the right upper quadrant, where the liver edge was felt about 2 cm. below the costal margin, and a rounded elongated mass was felt below the edge, giving the impression of a distended gall-bladder. The thyroid was described at this time as having a rounded mass in the left lobe the size of a "hen's egg." The pulse rate was 50 with a temperature of 101.2° F., the blood-pressure 100/70, the heart moderately enlarged with a systolic murmur at the apex. The arteries were not sclerotic. Under conservative medical treatment the gall-

bladder infection subsided and on September 17, 1926 the basal metabolism was + 25 per cent. The question of operation upon the gall-bladder and thyroid, either, neither, or both, again presented itself. There was considerable diversity of opinion by the Staff, some favoring no operation, some the gall-bladder alone, some the thyroid, and some even both operations. I placed myself on record on September 27, 1926 in the clinical chart, as follows: "I have followed this patient in the out-patient department since 1919. The heart-block and myocarditis have caused relatively little disturbance, and compensation has remained good despite several operative procedures, some under general anesthesia. Except for the recent gall-bladder attack, the thyroid (adenoma with hyperthyroidism) has given us most concern, and, though apparently it has not yet damaged the myocardium to any degree, I feel that continued hyperactivity (45 and 25 per cent. plus) will eventuate in further heart damage. Furthermore, after several years observation, I feel that this patient will be able to stand the necessary thyroid operation and that such should now be performed. The gall-bladder condition is now quiescent, and any operative procedures directed toward this should be deferred until after the more necessary thyroid operation. In fact, the gall-bladder may be treated without any operation, unless there are more active indications."

If you will recall, I advised against gynecologic operations in 1921 and 1923. Why was operation now advised? The notes made should be self-explanatory—in the first two instances the indications for operation and probable results therefrom were doubtful, and operation was opposed on those grounds rather than upon operative risk. Now, however, the indications seemed more definite, the probable benefit therefrom much greater, and despite the added risk due to the hyperthyroidism, operation was urged, more as a prophylactic measure to prevent later myocardial damage than because of present necessity. Remember that at this time there was still present the combination of complete heart-block with auricular flutter. Another basal metabolism test on September 30, 1926 showed + 49 per cent., and the patient was placed upon Lugol's solution m. v t. i. d. on

October 1st. By October 12th the basal rate had fallen to + 30 per cent., and on October 18th under local anesthesia Dr. Evarts Graham removed a large mass from the thyroid which occupied almost the entire left lobe, measuring 10 cm. in diameter. The pathologic report was "adenoma of thyroid." During the operation, which consumed only fifteen minutes, the pulse rate and rhythm was much disturbed, varying between 40 and 120, regular and irregular, the nature of the disturbance remaining in doubt until an electrocardiogram, taken one hour later, showed the presence of many extrasystoles, arising in the left and right ventricles, in addition to the auricular flutter with complete

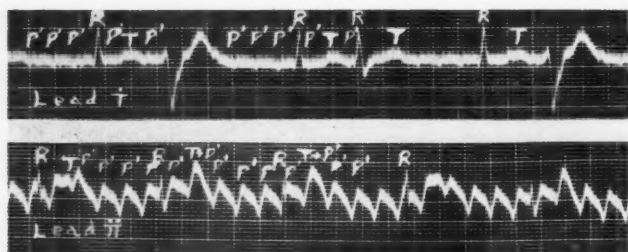


Fig. 60.—(E. K. G., 16,423—Leads I and II, October 18, 1926.) Showing complete heart-block with auricular flutter and ventricular extrasystoles. Taken one hour after operation for removal of adenoma of thyroid under local anesthesia. Auricular rate 330, ventricular 63 to 70. Note the increase in ventricular rate, due partly, but not entirely, to the extrasystoles.

heart-block (Fig. 60). This irregularity, however, did not cause any notable disturbance of the circulation and the patient's condition remained good throughout the operation and subsequently.

On November 4th, sixteen days after the operation, the basal metabolism had fallen to + 6 per cent., and the patient was discharged from the hospital two days later in good condition.

The auricular flutter continued and was last checked by electrocardiogram on November 19, 1926, having then been continuously present for nine months, the auricular rate at that time being 300, the ventricular 35. A month later, December 28,

1926, I noted that the rapid undulatory waves in the jugular veins had disappeared and that larger, slower waves had taken their place. Clinically, this indicated that the auricular flutter had stopped and an electrocardiogram was taken, that confirmed the clinical impression. The complete heart-block remained with a ventricular rate of 34, the auricles were beating normally with a rate of 75 (Fig. 61). There was no change in the symptoms or physical findings (other than that in the jugular pulse already noted) at the time of this transition from auricular flutter to the

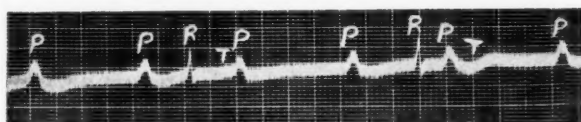


Fig. 61.—(E. K. G., 16,761—Lead II, January 4, 1927.) Showing complete heart-block. Auricular rate 75, ventricular rate 34. Note.—Taken two and a half months after removal of adenoma of thyroid. Basal metabolism + 6 per cent.

normal auricular mechanism. This latter mechanism has continued up to date, the patient being last examined on April 14, 1927, and having only slight dyspnea on exertion, with some palpitation. The pulse rate was 40. A basal metabolism test made on March 31, 1927 still showed + 6 per cent. (normal), and the patient is again gaining weight.

TABLE 1

<i>Date.</i>	<i>Basal metabolism.</i>	<i>Medication, etc.</i>
11/14/24	minus 16 per cent.	Thyroid extract, gr. ss-j t. i. d. 11/14/24 to 4/11/25.
4/14/25	plus 5 "	
11/ 6/25	plus 32 "	Lugol's solution, gtt. v t. i. d. 11/11/25 to 2/19/26.
3/17/26	plus 43 "	
7/ 2/26	plus 45 "	Acute cholecystitis, 9/10/26.
9/17/26	plus 25 "	
9/30/26	plus 49 "	Lugol's solution ㄢ v t. i. d. 10/1/26 to 10/18/26.
10/12/26	plus 30 "	Adenoma thyroid operation, 10/18/26.
11/ 4/26	plus 6 "	
3/31/27	plus 6 "	

Let us pause a moment to discuss the association of the auricular flutter with the hyperthyroidism. Was this association a result of cause and effect, or was it merely coincidental? We have known for some time of the frequent occurrence of auricular fibrillation, both in its transient and permanent forms, in patients with hyperthyroidism. Auricular flutter is much less common than fibrillation, but we have all seen instances of its occurrence with hyperthyroidism. Furthermore, according to the most recent theories of Lewis, auricular fibrillation and auricular flutter are both the result of similar physiologic activity, "circus movement," the one in a variable, the other in a constant path, so we would expect to find flutter in a certain number of cases of hyperthyroidism. In this particular case the relationship is clear. Auricular flutter was first noted after the onset of signs of hyperthyroidism, and with an increased basal metabolism. Flutter continued throughout the entire period of hyperthyroidism, not even responding to the measures usually effective in causing a reversion to the normal mechanism, and finally the auricular flutter spontaneously ceased, after the removal of the adenoma of the thyroid, with the return of the normal metabolic rate.

Another question, not so easily answered, presents itself in this case. Was the hyperactivity of the thyroid caused by the administration of thyroid extract or was it simply coincidental, an expected effect from this type of adenoma? Suffice to say that the picture changed from one of inactivity or even hypoadactivity to one of hyperactivity only after thyroid administration was begun. Were we justified in giving thyroid extract with a metabolism rate of -16 per cent., a gain in weight, etc.? In retrospect, so much easier than prophesy, I doubt if I would administer thyroid again under similar conditions.

Finally, I want to emphasize that our consideration of heart-block should not concern itself so much with the block itself as with the associated factors: the etiology (in this case unknown); the activity, that is, whether the block is stationary, variable, or progressive (in this case stationary); and the evidence of associated myocardial damage (in this case mild). Our prognosis

and decision about operations and other conditions which might arise should take into consideration all of these factors.

Summary.—A case of toxic adenoma of the thyroid associated with complete heart-block and auricular flutter is presented. The course of the patient during a long period of observation is outlined, with a discussion of the problems of medical and surgical therapy, together with lessons that may be learned therefrom.

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CLINIC OF DR. JOSEPH W. LARIMORE

BARNES HOSPITAL (WASHINGTON UNIVERSITY MEDICAL SCHOOL)

PHYTOBEZOAR

THE occurrence and the clinical significance of food concretions in the human stomach have recently had recurring mention in the literature. The roentgenologic diagnosis of alimentary diseases has added this among others to the list of gastric diseases which may be preoperatively diagnosed. The lack of any mention, and certainly of any adequate description, of this condition in the texts and systems of medicine indicate the small clinical attention it has received in the past. Hart¹ has collected 5 cases and added 8, and has demonstrated the clinical importance of the condition. The occurrence of other foreign bodies in the stomach is usually an accompaniment of other, usually psychic, disease. Phytobezoars occur in persons otherwise well. Their rarity is evident from their infrequent occurrence in large series of gastro-intestinal roentgenologic studies. The 2 cases reported here are the only ones met in a series of 5270 patients.

The clinical diagnosis of bezoar is impossible without the data of fluoroscopy. Even this may leave the character of the gastric filling defect in doubt. The frequency with which persimmons have been found gives the history of such ingestion some significance. The mimicry of other serious gastric or regional diseases is characteristic, and many casual or associated clinical findings give credence to these suggestions. Ulcers of the stomach may be associated. The following 2 cases illustrate some of the principle points and diagnostic problems of the condition.

Case I.—Female, aged forty-six years, widowed. The chief complaint was of chronic indigestion, of eight months' duration,

¹Hart, W. E.: Phytobezoars, *Jour. Amer. Med. Assoc.*, 81, 1870-1875, December 1, 1923.

with discomfort in the epigastrium and between the shoulders. It was not severe, but greatly annoying. The onset had been gradual, and the course continuous with frequent exacerbations characterized by much belching, considerable nausea, and vomiting once only. The pain was described as being real, but not severe, appearing in the central upper epigastrium, extending to between the shoulders, perhaps more to the right. It was not definitely associated with meals, and was somewhat greater during the night. The bowels had been constipated for three years with relief by use of milk of magnesia or mineral oil. The stools were notable only for occasionally a streaking with fresh blood. The diet was limited only by the voluntary elimination of acid foods. There was no loss of weight or strength. The patient had suffered from migrainous headaches all her life, a hemicrania with associated nausea and vomiting. There had been an abdominal operation fourteen years previous with hysterectomy, and gall-bladder drainage with the removal of stones. Physical examination was notable only for a low midline abdominal scar, and a right upper rectus abdominal scar. There were no palpable findings or tenderness. Temperature was 98.6° F.; pulse was 80; blood-pressure was 124/76; weight was 143.4 pounds; height, 5 feet, 6 inches.

Blood study: Hemoglobin, 79.5 per cent.; color index, 0.88; red blood-cells, 4,536,000; white blood-cells, 6760. The differential count was normal. Urinalysis: Yellow, foam white; no bile; specific gravity, A. M. 1.024; P. M. 1.020; reaction, A. M. alkaline, P. M. slightly acid; albumin negative; sugar negative; acetone and diacetic acid negative; indican negative. Microscopic: Few mucous threads, many squamous epithelia, few leukocytes. Stool analysis: Formed, brown in color, alkaline, occult blood reaction positive. Microscopic: Few starch-cells, an occasional striated muscle-fiber, an occasional plant spiral and plant hair, an occasional flat vegetable cell. Gastric analysis: 14 c.c. of clear fasting contents, no excess of mucus; occult blood reaction negative. Microscopic examination showed a few yeast cells, and an occasional epithelial cell. Fasting contents gave free HCl 36 per cent., total acidity 72 per cent., chlorids

660.2 mgm. The gastro-intestinal x-ray showed a constant central filling defect, the size of a small egg, in the distal stomach (Fig. 62) without an associated palpable mass. This persisted in the same position at five observations during three days. The gastric contour was little influenced, and peristalsis completed.

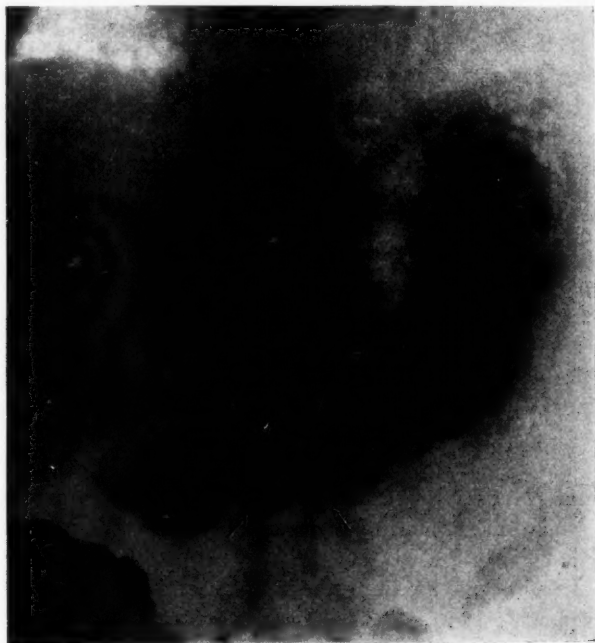


Fig. 62.—Case I. The picture was made prone and shows the food mass (bezoar) in the distal stomach grasped by the peristalsis. All x-ray observations found the mass in this position and it was also there at operation, but was easily dislodged at the first handling of the stomach.

There was no indication that the stomach wall was infiltrated. The stomach emptied within six hours. The gall-bladder, by oral cholecystogram, was without suggestion of stones and was considered normal. The roentgenologic diagnosis was benign adenoma.

Operation: Dr. A. O. Fisher: The stomach was presented in the wound, and there were dense adhesions about duodenum and pylorus, resulting from a previous gall-bladder drainage. A hard tumor mass was felt prepyloric. It was an irregular, firm tumor about 5 x 3 cm. in diameter. There was no change of any kind in the stomach wall. It was of normal thickness and appearance. The foreign body was elusive and escaped several times before being finally secured against the anterior wall, where it was removed through an incision made parallel to the long axis of the stomach. It was a dark colored, homogeneous mass, firm but friable, and looked a good deal like putty. The patient's postoperative course was uneventful and there has been complete clinical relief.

Case II.—Male, aged twenty years, single, a miner. The patient came into the Washington University Out-patient Department complaining of pain in the upper abdomen after meals and of associated belching. Initial history was of onset twelve months previous, being constant since, and gradually becoming worse. Pain was in the upper abdomen, usually from one to two hours after meals, and worse at night. The pains were occasionally more severe immediately before meals, and relieved by eating. There had been considerable nausea, but no vomiting. Belching was persistent and without regurgitation. The history elicited subsequently in this case is that the onset of the complaints immediately followed a hunting expedition when the party found a persimmon tree, and, after filling their pockets, ate constantly on their walk home. This information was volunteered when the patient was asked, if he had ever eaten persimmons. There was discomfort immediately following, but no "acute indigestion." The bowels are regular. Appetite was normal with regular varied meals without notable influence of different foods. There had been no jaundice, no localized pain, and no urinary disturbances. There had been a loss of about 8 pounds in weight. The physical examination was not notable and the mass, which was palpable before the fluoroscope, had not been found in the Out-patient Department during recumbent palpation. The urine examination

of a voided specimen showed a pale yellow color, an alkaline reaction, a specific gravity of 1.010, but no albumin or sugar, or notable microscopic findings. Stool analysis showed fairly soft, dark brown stool of acid reaction. There was a faintly positive reaction to the guaiac test for occult blood. Microscopic examination was not notable. Gastric analysis of 53 c.c. of fast-



Fig. 63.—Case II. The same stomach as in Fig. 64, but in the prone position. The phytobezoar now in the gastric fundus.

ing contents showed a moderate increase of mucus, and a yellow color. Lactic acid was negative. Free HCl 27 acidity per cent., with total acidity of 56 per cent. There were a few white and red blood-cells noted. The test-meal after forty-five minutes yielded 55 c.c., showing increased mucus with 42 acidity per cent. free HCl, and total acidity of 57 per cent. Gastro-

intestinal x-ray examination revealed a large filling defect in the pars media of the stomach, about the size of a lemon, which by palpation could be displaced into the fundus (Fig. 63), and into the pars pylorica (Fig. 64) where it could be fairly firmly grasped by antral peristalsis. The total gastric



Fig. 64.—Case II. The filling defect in the prepyloric stomach simulates **very** much cancer. It was, however, displaceable as shown in Fig. 63.

motility was within six hours. Gastrotomy was done by Dr. Duff Allen and the mass shown in Fig. 64a removed.

The first case shows the imitation of gall-bladder disease, doubtless, occasioned in this instance by actual old pericholecystitis, which would otherwise have been silent. The previous removal of stones by gall-bladder drainage suggested the re-

currence of stones. This was negatived by the cholecystogram. The roentgenologic gastric studies showed a persistent filling defect, without infiltration of the muscular wall. Because of its constant position, the tumor was considered more likely to be benign hyperplasia (polyp or adenoma) than a bezoar. Operation, however, revealed the latter.

In the second case duodenal ulcer is imitated. The hunger pains, which were often worse at night, are characteristic of ulcer. The pictures eliminate duodenal ulcer, and suggest an explanation for this mimicry. When the stomach is full and has a "one

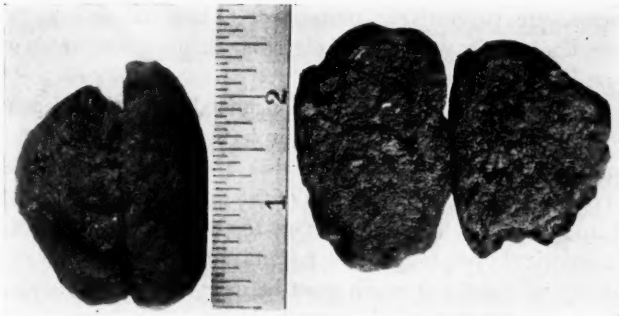


Fig. 64a.—Phytobezoar removed by gastrotomy from Case II and shown to be of persimmon residue.

pint posture" there is no grasping of the foreign body as occurs when it is empty or nearly so. This grasping of the foreign body could reasonably accentuate the normal hunger contractions to a painful degree.

The process of the formation of the bezoars is indeterminate. It is obvious, that ingesta having a great cellulose and other residue is essential. Otherwise, surface digestion would cause disintegration. It is probable that inordinate and hasty eating of a single food, and without adequate mastication, creates a mass favorable for compression by the stomach. The spasm of the stomach in the acute indigestion, which follows such indiscrete eating, may very well initiate the formation of the mass.

The skins, seeds, and pulp, of prunes and persimmons, the fiber of vegetable matter, pumpkin, celery, salsify, and muscle-fibers, connective tissue, fatty acid crystals, and cellular débris have been found in these food masses. The high content of gum and nectin in the persimmon is given as a reason for its frequent occurrence in bezoars.

Once such a food mass is formed, the usual peristalsis constantly continues compression of it. There is no mechanical tendency to breaking the mass. Prolonged mastication and the adequate admixture of saliva, and the general custom of adding sugar and cream to that type of fruit, which lends itself to this process, are suggestively protective. These admixtures will cause lines of cleavage and of digestion in any mass which will allow its disintegration.

The roentgenologic diagnosis of such food concretions depends upon their being non-opaque and displacing the barium mixture. Progressive, and completing peristalsis, and the absence of other and direct evidence of infiltration of the gastric wall suggests the nature of these tumors. However, to differentiate them from intragastric hyperplasias (polyps and adenomata), their free mobility within the stomach must be demonstrated. They can be so large as to have little or no mobility. The differentiation from cancer in such cases would be difficult. The dividing and enveloping stream of barium is reasonably conclusive against cancer. Six-hour retention by the stomach did not occur in these cases, and is not significant.

The treatment of the condition is surgical. Efforts at breaking up food concretions by medicines are largely futile. Gastroscopy and direct attack has been reported, but without encouraging success. Massage may be effectual, but the danger of trauma to the intact or ulcerated mucous membrane contraindicates it.

CLINIC OF DR. JOSEPH GRINDON

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NOTES ON THE DAVIS TREATMENT AND TRYPAR-SAMID IN ACUTE PEMPHIGUS¹

THE term "Pemphigus" was long applied generically to all dermatoses of which bullæ are the chief features, although clinical varieties were recognized and designated by specific titles. The list of these was reduced by Duhring's clear vision of dermatitis herpetiformis as a clinical entity, and by the recognition of *P. neonatorum* as a form of impetigo contagiosa. The term "syphilitic pemphigus" obviously carried its own condemnation. There remain today four accepted species of the genus pemphigus, namely *P. chronicus*, *P. foliaceus*, *P. vegetans*, and *P. acutus*. The cases here detailed belong to the last-named group.

Acute septic pemphigus is a well-defined type, although one may occasionally hesitate in cataloguing a borderline case. Its characteristics are: (1) Rapid onset, usually reaching a peak in three to six weeks; (2) eventual distribution over the whole surface; (3) huge size attained by lesions through peripheral extension and coalescence; (4) rapid course of individual lesions, with equally rapid restoration of epidermis; (5) involvement of oral and nasal cavities, conjunctivæ and vagina (the mouth is always affected, usually from the first); (6) high mortality. Until the introduction of the Davis treatment, four years ago, death in two or three months was all but certain, although rare instances of recovery had been reported by Pusey and others. This treatment has yielded a good proportion of apparent re-

¹ From the Department of Dermatology, St. Louis University School of Medicine.

coveries, and was the first and only method to afford more than a ray of hope in this desperate condition.

While several investigators have found a diplococcus in the serum of unruptured blebs, the exciting agent remains unknown. A number of cases have occurred in butchers, and others exposed to contact with presumably contaminated animal tissues, while in others there was no evidence or probability of such contacts.

The patient's general condition is usually but slightly disturbed for the first few weeks, even though the cutaneous lesions may by that time have attained wide distribution and massive proportions. Eventually, however, he weakens and enters upon a rapid decline with evidences of profound sepsis, terminating in death, as before stated, in a few more weeks.

The treatment originated by Dr. R. H. Davis and the late Dr. W. D. Davis, both of the Department of Dermatology of St. Louis University, consists in the intravenous or intramuscular injection of arsenicals, together with the subcutaneous injection of coagulens. At first iron cacodylate was given by the intravenous route, but later Dr. R. H. Davis has used a solution containing 2 per cent. each of sodium arsenate and phenol, the dose being 1 c.c. on alternate days, by either the intravenous or intramuscular route.

Arsenic in the treatment of pemphigus is indeed no novelty, but it is believed that the renewed interest in the subject, awakened by the Davis method, may justify this report of only 2 cases, while the almost uniformly fatal outcome attending all other methods urges one to present without delay any added experience which may seem useful. In one of these cases, tryparsamid was substituted for sodium arsenate with an encouraging measure of success.

The first case in which this method was employed by the writer is not here detailed, having been included in the original report on this subject (Case V).¹ Briefly, it concerned a man of forty-four years, and of previous good health, in whom the treatment was begun two months after the onset of symptoms, and

¹ A Contribution to the Treatment of Pemphigus. By Dr. R. H. Davis and Dr. W. D. Davis. Arch. of Derm. and Syph., Nov. 1923, p. 627.

continued until within a few days of his death, which occurred after four months' illness. At no time was there any apparent benefit.

The first case now reported was admitted to St. John's Hospital on May 19, 1926. A nun, sixty-three years old, obese, had suffered an amputation of the left thigh at its middle twenty years earlier for "a bad sore." On account of her general helplessness she had for many years sat still all day, doing a little occasional sewing, and had had no opportunities for contacts with animals or animal tissues. She had not been vaccinated for many years. Family and past history good except as above stated. Abdomen, chest, heart, kidneys, cervical and thyroid glands, ears, and pupils negative. Appetite good.

Five weeks earlier there appeared erythematous spots on the hands and right (remaining) foot, attended by burning sensations, and rapidly forming bullæ. These spread upward, involving the trunk and the greater part of the surface. At her admission there were small and large bullæ, up to 5 cm. diameter, on neck, chest, abdomen, axillary and inguinal folds, back, and upper and lower extremities. Many had broken, exposing wide denuded areas 15 cm. or more across. The face, scalp, and palms remained free. She complained of her throat, but no lesion was discoverable. The urine was negative throughout. The blood showed: Red blood-cells 3,890,000, white blood-cells 7000, hemoglobin 80 per cent. Differential: polymorphonuclear neutrophils 57 per cent., eosinophiles 4 per cent., small lymphocytes 25 per cent., large lymphocytes 12 per cent., mononuclears 2 per cent., blood-sugar 105 mg., blood-calcium 9 mg., non-protein nitrogen 27 mg. Wassermann negative. The Davis treatment was at once instituted.

Ten days later bullæ appeared in the mouth. On June 12th severe pain developed in the right knee with edema. The case continued with little variation throughout the remainder of June and during July, bullæ being generally present in the mouth, and constantly healing and reappearing in great numbers on the general surface. They were, however, gradually growing somewhat smaller, and the patient's general health seemed little

altered, save for occasional nausea. On the other hand, there was severe pain much of the time in the lower extremity, but the thick layer of subcutaneous fat precluded any thorough examination to determine its precise seat or cause. It seemed probably due to phlebitis.

Early in August there was marked improvement in the skin and throat symptoms, and systemic condition. This continued until by the middle of August only a few minute blisters remained, and by the middle of September all skin lesions had disappeared. The temperature, which had never been especially high, returned to the normal. A few days later, however, nausea supervened. The patient gradually lapsed into unconsciousness apparently from toxemia and exhaustion, and died on October 3d.

The case is noteworthy for having lasted five and a half months, an unusually prolonged period for this type of pemphigus, especially in view of its severity during the first half of its course. It seems at least probable that the treatment had a mitigating effect upon the skin and oral lesions.

The second case is that of a woman, married, aged thirty-two, who was admitted to the St. Louis University Hospital (St. Mary's Infirmary) on January 30, 1927. Former health good, except for mumps and varicella in early childhood, typhoid at ten, diphtheria at twelve, and pneumonia at fourteen. Well developed and well nourished. Moderate hypothyroid-pituitary type. Four normal-term pregnancies. Chest (including plate), heart (including electrocardiogram) abdomen, throat, reflexes, and urine negative. Pulse and temperature normal. Teeth: upper complete plate, lower apparently sound. Blood-pressure 110/70, hemoglobin 90, red blood-cells 5,020,000, white blood-cells 11,400. Differential: Polymorphonuclear neutrophils 84 per cent., eosinophiles 6 per cent., small lymphocytes 6 per cent., large lymphocytes 2 per cent., large mononuclears 2 per cent. Wassermann negative. Non-protein nitrogen 33.3 mg, blood-calcium 9.5 mg. Cultures from blood and intact bullæ negative.

Three weeks ago she developed itchy macules on face and

arms. After five days, vesicles appeared upon the macules, diagnosed by the family physician as varicella. There were also blisters upon the tongue and palate. Patient experienced some chilly sensations, but had no true chill or fever. No gastric or intestinal symptoms.

On entering, patient presented numerous varicella-sized vesicles on the face, and many hazel-nut-sized blebs on the upper chest, shoulders, and inner aspects of the upper arms. Some were hemorrhagic. A few blebs were scattered on the abdomen, back, thighs, and vulva. The mouth lesions had healed. The patient declared she felt well.

She was at once placed upon the Davis treatment, following the same technic as in the last case, together with protecting and soothing local applications. The bullæ continued to grow larger, many being 2 and 3 cm. in diameter, and to invade wider areas, until, by February 11th, they covered both upper extremities, the thighs, and buttocks, and were so thick-set as to be coherent in many places. At this time the blood-count showed: White blood-cells 14,550, polymorphonuclear neutrophiles 69 per cent., eosinophiles 15 per cent., small lymphocytes 11 per cent., large lymphocytes 4 per cent., and basophiles 1 per cent. The temperature varied from 98.5 to 99.5° F. until February 11th, when it suddenly rose to 105° F. There was severe pain in the throat. Examination showed a superficial ulcer involving a large part of the epiglottis. Quinin sulphate was given, 0.65 morning and evening, four doses, then 0.32, similarly, four doses. The temperature fell, and from February 12th to 16th varied between 101 and 103.5° F., but on February 17th rose to 105.5° F., when four morning and evening doses of quinin, 0.65, were again prescribed.

Meanwhile the eruption continued to spread until virtually the entire surface was covered with bullæ or with wide, raw patches where these had coalesced and broken. The nasal passages were painful and bled, and the mouth showed large denuded areas making feeding difficult. The patient had now become pale, and was rapidly emaciating. Her condition had become pitiable, and, although gifted with remarkable cheerful-

ness and fortitude, it was evident that her resistance was breaking down.

In view of the fact that she had become steadily and rapidly worse in spite of the measures employed, it was decided to try the effect of another arsenical. Tryparsamid suggested itself on account of its relatively low toxicity and its value in raising tissue resistance, as seems to be shown by its good effect in late neurosyphilis. The kidneys and eye-fundi being found apparently normal, on February 19th 2 grams of tryparsamid were introduced intravenously. The same dose was repeated on February 26th, and March 4th and 11th, and pursuant to the improvement to be related below, was reduced to 1 gram on March 19th and 25th. A second examination of the fundi on March 11th had shown no pallor or other abnormality.

Improvement showed itself within a few days of the first injection. Only a few new lesions appeared, while the old ones rapidly healed. The temperature varied between 99 and 100° F. for the most part, occasionally rising to 101 or 102° F., until March 10th, when it came down still lower, and for the next fortnight ranged between 97 and 99.5° F. Meanwhile a marked amelioration in the skin condition continued, and by March 24th the surface was clear of lesions save for a vesicle every day or two, rarely exceeding 1 mm. in diameter. Lesions of the oral and nasal mucosæ were rather more persistent, with occasional bleeding, generally from lesions at the anterior part of the septum.

On March 24th the temperature suddenly rose to 102.5° F., and the patient complained of severe pain in the upper anterior part of the left thigh. The femoral vein could be felt as a thick, hard cord for several inches below the saphenous opening, and was most tender on pressure. Phlebitis was recognized, but yielded in a few days to a continuous warm, moist pack. From that time on the temperature remained normal.

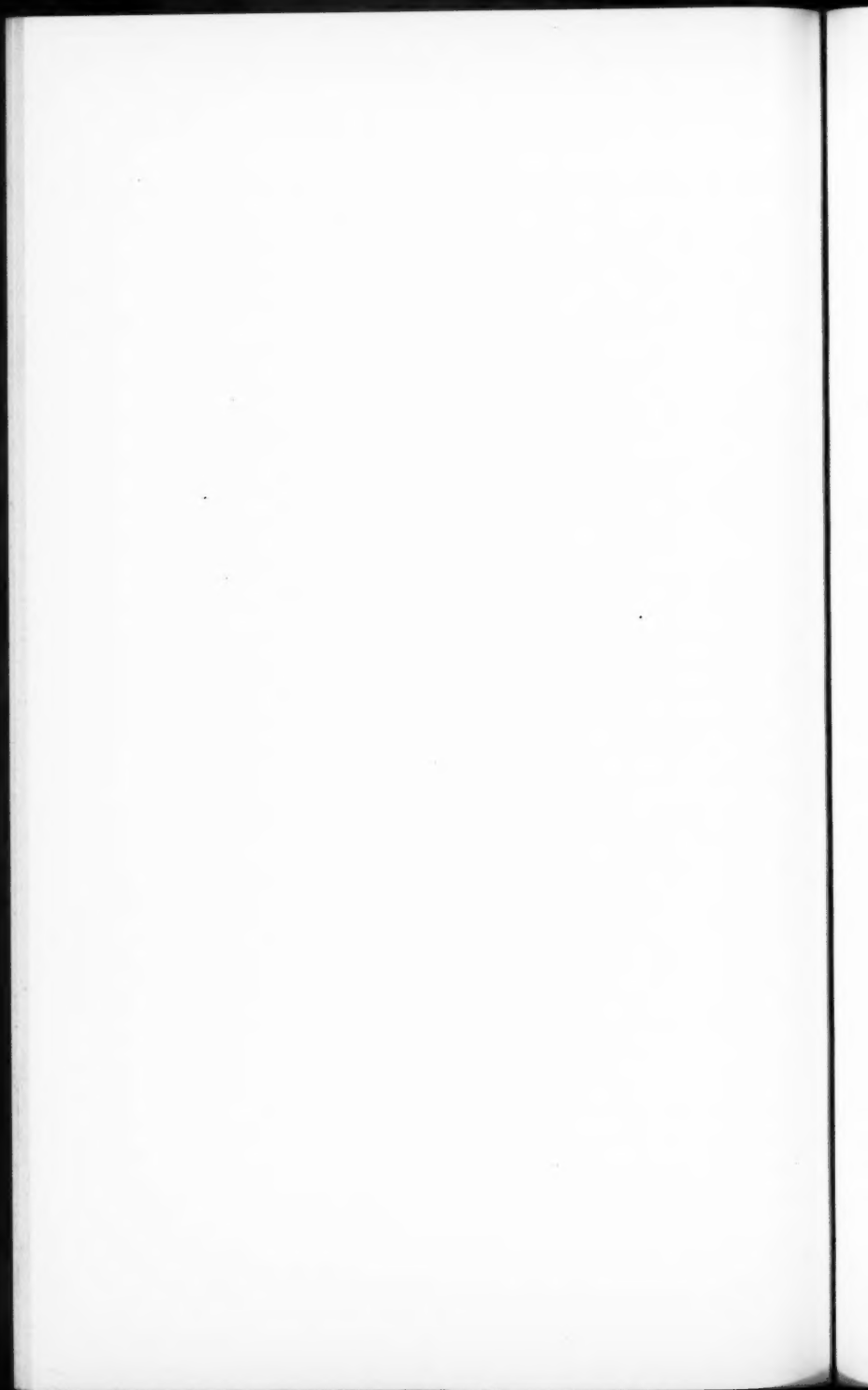
The patient left the hospital on April 20th. In the last five days she had had four pin-head vesicles on the face and thigh. There was some muscular tremor. Every few days she brought up some epithelial shreds from the throat, for which

she was referred to Dr. E. T. Senseney who found ulceration of the tip of the epiglottis. This yielded in two days to an application of mercurochrome (20 per cent.). Urinalysis was negative. Soon thereafter there occurred a copious fall of hair, probably due to the arsenic. A small dose of Fowler's solution with tincture of iron was nevertheless prescribed.

There were occasional minute skin and throat lesions until May 21st, when a bulla, 1 cm. in diameter, appeared on one finger, with many small lesions on the vermilion and mucosa of the lower lip. The patient was then placed on intramuscular injections of sodium cacodylate, 0.3 twice a week, with applications of mercurochrome (20 per cent.) to the lip lesions. This was always followed by their rapid disappearance.

June 12th: For the last three weeks, since the use of the cacodylate injections, there have only been occasional small oral lesions. The general condition is satisfactory.

Summary.—Two cases of acute pemphigus are reported. Phlebitis occurred in both. One received sodium arsenate and coagulen, and ran a prolonged course, all skin and oral lesions disappearing two weeks before the patient's demise from toxemia and exhaustion. The second case grew worse under sodium arsenate and coagulen, but soon improved under tryparsamid and coagulen, and has now for two and a half months remained free from all but occasional minute lesions.



CLINIC OF DR. ALPHONSE McMAHON

ST. JOHN'S HOSPITAL

THE ASSOCIATED CARDIAC STATES IN HYPERTHYROIDISM

HYPERTHYROIDISM, a clinical condition of increased activity of the thyroid gland, in which there is in the peripheral circulation an abnormal amount of thyroxin, or a chemically altered thyroxin, is found associated with two pathologic states of the gland.

1. Diffuse hyperplasia and hypertrophy producing the clinical syndrome known as exophthalmic goiter.
2. Circumscribed areas of glandular tissue, single or multiple, which secrete an abnormal amount of thyroxin, known as *toxic adenoma*.

An increase in the thyroxin content of the blood-stream is associated with definite changes in the metabolism of the organism affecting all tissues. There is, in the first place, a stimulation of the cellular metabolic rate, which means that the oxygen exchange is increased and, at the same time, there is an increased production of CO_2 , which conditions, as we shall see later, play a part in the production of cardiac changes in hyperthyroid states.

The heart is likewise affected by the toxemia, its tissues responding both to the sympathetic nerve irritation and also to the direct cellular irritation of the toxin. In fact, in the early history of exophthalmic goiter, the syndrome was spoken of as a primary heart condition associated with nervousness and exophthalmos. It was only after continued investigation that the unity of the syndrome was established, and the heart given its proper position in relation to the entire clinical state.

As information accumulated it was found that anatomic cardiac changes were not constantly associated with all cases of exophthalmic goiter, and it was felt that certain individuals, in whom cardiac involvement, appeared must have had a "cardiopathic tendency." Later the adenomata were recognized as etiologic factors in the production of a state of hyperthyroidism, and the consequent anatomic heart conditions. It may be said that the ultimate cardiac pictures are the same in both exophthalmic goiter and toxic adenoma, though the appearance and progress of the heart involvement differs in the two states.

The importance of the position of hyperthyroidism in relation to cardiac disease has not been properly stressed. We are inclined to think of the etiology of heart disease in terms of "rheumatic fever," "syphilis," "arteriosclerosis," "nephritis with hypertension," and truly we should, for these conditions are responsible for the largest number of the pathologic hearts which we see in clinical practice. However, the thyroid is responsible for a certain percentage of chronic heart conditions, particularly is this seen in the toxic adenoma of relatively slight activity, and as such it must be borne in mind in the study of heart cases, especially in the more obscure types where the history is indefinite, symptoms are slight, and physical findings in the heart are inadequate to explain the symptoms.

I wish here to present a case of exophthalmic goiter with an auricular fibrillation which is one cardiac manifestation of the thyroid toxemia. This case had a thyroidectomy with the consequent improvement in all symptoms, and a return of the heart to a normal rhythm.

A. B., No. 8403, age forty, white, female, referred by Dr. E. Murphy for a medical study and treatment.

Present History.—The chief complaints were: (1) Nervousness, (2) tremor, (3) emotionalism, (4) loss of weight, (5) fatigability and general weakness, (6) exophthalmos, (7) hyperidrosis, (8) thyroid tumor, (9) cardiac palpitation with dyspnea and tachycardia on moderate exertion. Duration: Three months. Onset: Gradual with the appearance of the nervousness, fatigability, and loss of weight. The exact amount

of weight lost is not known, but the loss has been very gradual and definite. Progress: Almost synchronously with the appearance of the constitutional symptoms, the cardiac palpitation became evident, occurring chiefly after exercise, the patient becoming conscious of a marked increase in the heart-rate, and definite irregularity in rhythm, associated with dyspnea which subsided rapidly on resting. The palpitation gradually became more constant, present during rest, and associated with definite consciousness of persistent cardiac irregularity, a feeling of uneasiness and weight in precordium, a more pronounced dyspnea on even slight exertion. The emotional reaction was rather severe, the patient developing fears of a cardiac death, etc.

At the present time there is a persistent palpitation with cardiac irregularity, associated with the constitutional symptoms enumerated above. Nervousness and tremor are severe, emotionalism and fears are present, together with a rather decided fatigability and general weakness which have been definitely progressive, so that at the present time patient is confined to bed. The thyroid tumor has been slowly increasing in size. The exact time of appearance of the enlargement is not known. The exophthalmos was first noticed about three months ago, and in this time has increased very little. There is no history of edema, cough, abdominal pains, or gastrointestinal upset.

Past History.—General health has been good. Had the usual childhood diseases with no sequellæ. There is no history of pneumonia, typhoid, acute rheumatic fever, scarlet fever, or diphtheria. An acute tonsillitis occurred about one month before entering hospital. There is no history of earlier attacks. Gastro-intestinal system: Occasional attacks of gastric flatulency, bearing no relation to food. Other systems essentially negative.

Personal History.—Sleeps fairly well. Appetite good. Bowels regular. Nycturia once, no dysuria. *Menstrual history:* Onset at twelve years of age, regular, moderate, twenty-eight day interval, four days' duration, slight dysmenorrhea.

Family History.—Essentially negative.

Physical Examination.—*General:* Patient conscious and rational, fairly well nourished, lying in bed comfortably, in no pain, but apparently very nervous. The face is diffusely flushed and the eyes show an exophthalmos of moderate degree. Extended fingers present a fine and coarse tremor with a tremor of the protruded tongue. There is a faint brownish tinge to skin of neck and body, much less marked over the more unexposed parts of the body. Hands and feet are warm and moist. There is no edema or cyanosis. No generalized adenopathy. *Regional:* Head, well formed, regular in contour with no pressure-tender points. Hair medium texture, slightly oily. No scars or eruptions. Temporal vessels not tortuous or pulsating. *Eyes:* Definite widening of palpebral fissures with exophthalmos of moderate degree. Thyroid eye signs are positive. Pupils are equal, regular, symmetrical, react promptly to light and accommodation. Eye muscles intact. *Ears:* Negative, hearing normal. *Nose:* Grossly negative. *Mouth:* Mucous membrane of normal color. No scars or pigmentation. Teeth in very poor condition with evidence of caries and periodontal infection. Tonsils are injected and enlarged to a slight degree. *Neck:* Thyroid is diffusely enlarged to a moderate degree, the right lobe being larger than left. It is smooth in contour, of medium consistency with no thrills or bruits. There are no adenomata palpable, the submaxillary glands are palpable, no other cervical glands are enlarged. *Thorax:* Symmetrical, no abnormalities in contour. Expansion fair and equal on both sides. No retractions. *Lungs:* Percussion resonance normal throughout. Breath sounds are normal. *Heart:* On inspection the apex impulse is seen to lie within the mammillary line, diffuse and irregular, and on palpation found to be somewhat heaving in character without palpable thrill. The borders are within the normal to percussion. Auscultation reveals a completely irregular heart, tumultuous, rapid rate, at apex varying between 110 and 150 per minute with a pulse deficit of 10 to 20 per minute; very questionable systolic murmur at apex. Sounds are fairly clear with a slight accentuation of second aortic sound at the base. The heart is clearly fibrillating, the apex rate varying under observation. *Pulse:*

Extremely irregular in force and rhythm, the rate varying between 90 and 130 to 140 during examination. The pulse is fairly easily compressible. The *blood-pressure* (systolic) is 140 min. Hg. while the diastolic is 100. This also fluctuates under observation. *Abdomen:* Hyposthenic type, no tumefactions or visible peristalsis, no tenderness or rigidity on light palpation. No masses felt. Diffuse, irregular, epigastric pulsation. No organ pathology demonstrable. *Vaginal and Rectal Examination:* Grossly negative. *Extremities:* Bones and joints negative. There is a fine and coarse tremor of extended fingers as mentioned above. *Reflexes:* Slightly hyperactive throughout.

Laboratory Examination.—*Urine:* Specific gravity 1008, reaction neutral. Albumin, negative. Glucose, negative. Red blood-cells, negative. White blood-cells, few. Casts, negative. Blood, essentially negative.* Blood-sugar, 0.09 per cent. Basal metabolism, + 35 per cent.

Course in Hospital.—One week after entering hospital, with no change in cardiac rhythm, a subtotal thyroidectomy was performed, following which there was a distinct increase in the pulse-rate with some aggravation of the toxemia. It was decided at this time to put the patient on digitalis to see whether the return to normal rhythm could be hastened. At the same time small doses of Lugol's solution were given, 5 minims three times a day. The following is a more detailed record of the course:

August 9th.—Following the operation, tincture of digitalis was started, 20 minims, A. M. and P. M. At this time the apex-rate was 110 per minute, the pulse-rate 96 with marked irregularity. Pulse deficit 10 to 15 per minute.

August 10th.—Digitalis increased to 20 minims every three hours. Pulse-rate 160 per minute, irregular with more pronounced cardiac palpitation. Pulse deficit continues.

August 11th.—Pulse-rate and character same, though general condition is improving. Has had 180 minims of tincture digitalis to date, the calculated dosage for present weight of 127 pounds is 190 minims. Dosage to be reduced to 20 minims, A. M. and P. M. Lugol's increased to 7 minims, three times a day.

August 12th.—Pulse more regular, has lost the characteristics of a fibrillation, appears to show extrasystoles occurring at irregular intervals. Volume better. General condition very much improved. Palpitation has disappeared.

August 13th.—Condition decidedly improved, sleeping better. Pulse about 108 per minute, irregular, with extrasystoles. The fibrillation is apparently under control. There are as many as 20 beats in regular sequence. Tincture of digitalis reduced to 15 minims twice a day. Lugol's solution, 8 minims, three times a day.

August 14th.—Condition same. Blood-pressure 150/70. Tincture of digitalis increased to 20 minims, twice a day. Lugol's increased to 9 minims, three times a day.

August 15th.—Heart still irregular, fairly slow fibrillation. General condition improving. Lugol's solution increased to 10 minims three times a day.

August 16th.—Heart same. Blood-pressure 158/72.

August 17th.—No change except general slowing of pulse, which is, however, still irregular.

August 18th.—Pulse absolutely regular in force and rhythm. Rate 72. No evidence of fibrillation. Not conscious of heart beat. Tincture of digitalis reduced to 10 minims, three times a day, and continued at this dosage for three days, when it was discontinued entirely.

The pulse remained absolutely regular after restoration of rhythm during entire stay of patient in hospital, until August 28th, when dismissal occurred. The pulse rate varied between 68 and 80 during this time. Digitalis was discontinued on August 21st, but Lugol's solution, 10 minims, was continued until dismissal of patient.

Discussion.—This case is presented to show one of the effects of a hypersecretion of the thyroid on the function of the heart. The arrhythmia, in this case an auricular fibrillation, we feel is due to the thyroid toxemia. Its onset coincidently with the major symptoms of hyperthyroidism gives sufficient proof of its relation to the disturbed thyroid function, and its improvement and final disappearance, rapidly following the extirpation

of the thyroid gland, gives additional proof of the causal relation between the two.

The use of digitalis was probably entirely unnecessary as the greater number of these early cases are restored to normal rhythm by the simple removal of the gland. Its use was suggested in an effort to effect an earlier restoration of the heart to normal rhythm. Whether or not this was achieved is difficult to say. We think that some form of digitalis should be used in all long-standing cases of auricular fibrillation in thyroid disease, contrary to the opinion, expressed by many, that it is of no value. It is quite true that the use of digitalis alone without the proper surgical procedure in the severe hyperthyroid hearts may be of no avail in restoring the heart to normal function, still its use should be continued and particularly recommended in conjunction with surgical procedures.

In studying the etiology of these cardiac changes in toxic thyroid several theories are found to have been advanced. In the following order these have been: (1) Mechanical. (2) Toxic. (3) Mechano-toxic or "overwork theory" of Boas.

For many years the mechanical theory was prominent, holding that the pressure of the enlarged thyroid on the trachea and great vessels produced certain circulatory changes, which threw an added strain on the heart resulting in the usual conditions as we find them.

The toxic theory explained the changes on a basis of cellular irritation of heart-muscle cells by the excess thyroxin, or the chemically altered thyroxin ultimately resulting in a poisoning of the myocardium.

The "mechano-chemico-toxic theory," if this invented term may be used, also known as the "overwork theory" of Boas, explains the changes on the basis of the increased work thrown on the heart by the heightened cellular metabolism, the resultant cardiac fatigue making the myocardium more sensitive to the increased thyrotoxin.

Boas¹ states, that in exophthalmic goiter there is a decided increase in the vascularity of the gland, so that the volume flow per minute through the gland may increase from the normal of

100 c.c. per minute to 500 or 1000 c.c. per minute. This increased flow throws an excess load on the heart, and to maintain efficient circulation the minute volume of the heart must be increased. An increase in the basal metabolism indicates a greater consumption of oxygen, and an increased elimination of CO_2 . This oxygen must be supplied by an increase in the minute volume flow of blood which is effected either by (1) increased systolic output of the ventricles, or (2) accelerated heart-rate. The former has not been proved to be true, and so the increase in the minute volume flow of blood must be obtained by the accelerated heart-rate which is a condition constantly associated with the hyperthyroid states. The increase in the minute volume flow of blood may be 25 to 60 per cent. greater than normal.

In the hearts showing the simple manifestations of the thyroidemia, *i. e.*, tachycardia and forcible beat, there are no demonstrable pathologic changes. However, in the true cardiac disease cases showing, clinically, enlargement of the heart, auricular fibrillation, and, in severe cases, congestive heart-failure, we find certain rather constantly associated pathologic changes, macroscopically, hypertrophy and dilatation involving all chambers of the heart; microscopically, according to Wilson²: (1) Fatty degeneration, (2) diffuse necrosis of myocardium, (3) lymphocytic infiltration of the interstitial tissues. The functional pathologic changes may take place in the following way: The increase in the metabolic rate following the excess of thyroxin in the circulating blood produces an increase in cardiac work, which is manifested by the tachycardia and the greater volume outflow per beat; as a result of this extra demand for energy, the heart hypertrophies and with a continuance of the strain, as in other pathologic cardiac states, dilatation results with ultimate degeneration and fatigue with or without arrhythmia. It is noted that many fatal cases of toxic goiter show no myocardial changes, and that death results from toxemia with its consequent cellular exhaustion and is not primarily due to the heart.

In the early stages of thyroid disease we find in the heart a simple reaction to the toxemia, a tachycardia of the sinus va-

riety. This increase in rate is, as we have seen, a response to the need of an increase in the minute volume output of the heart and may occur through an increased production of metabolites. It is in no way comparable to the size of the gland, but does in most instances bear a definite relationship to the degree of toxemia as measured in terms of the increased basal metabolic rate, and is therefore a reliable measure of the thyroid activity. The pulse varies between 100 and 120 per minute, may reach 160 to 180 per minute, is usually rhythmical but sometimes shows evidence of a sinus arrhythmia, which is not due to organic disease. The rate is increased by exertion or emotional excitement.

In addition to an increase in the *rate*, we find an increase in the *force* of the heart-beat which is manifested on physical examination by a diffuse apex-beat, somewhat heaving in character, producing a vibration of the chest wall and a pseudo-thrill which may simulate a mitral stenosis. The forcefulness of the beat becomes more pronounced as the hypertrophy increases.

Accompanying the increased cardiac activity we find vascular phenomena, which are associated with and dependent in some measure upon the cardiac changes. The pulse is large, full, and of the Corrigan type. There is sometimes a marked pulsation of the peripheral vessels with a capillary pulse. The systolic blood-pressure is usually increased, and there is, also, a slight increase in the diastolic pressure, the result of which is an increase in the pulse pressure producing the vascular phenomena of aortic regurgitation. The differentiation may be based upon an absence in the toxic thyroid heart of a diastolic murmur, and the presence of an increased basal metabolic rate.

According to Willius and Boothby,³ in exophthalmic goiter the systolic pressure is elevated, the diastolic normal or lowered, and the pulse-pressure increased. In toxic adenoma the systolic pressure is greater than in exophthalmic goiter, the diastolic pressure is elevated so that the pulse-pressure is lower than in exophthalmic goiter.

Cardiac murmurs are frequent in thyroid hearts, probably occurring slightly more frequently in cases of toxic adenoma.

There are two usual types; one, the pure functional, a systolic blowing murmur heard best at about the third left intercostal space; the second a relative mitral murmur due to dilatation of the left ventricle, systolic in time, blowing in character, heard best at apex with variable transmission. The functional type frequently disappears with slowing of circulation, while the mitral murmur, due to dilatation, improves with the restoration of cardiac function. These above cardiac manifestations of toxic thyroid may be spoken of as the functional cardiac disturbances or, as they have been called, "the primary cardiovascular phenomena." They occur constantly, serve as diagnostic features of the disease, and represent by far the largest percentage of the heart disorders in toxic thyroid states.

The organic heart disturbance or true heart disease occurs in a relatively small percentage of cases, varying in different series between 20 and 35 per cent.

These important cardiac changes which occur in the course of hyperthyroidism seriously interfere with the cardiac function and may be directly responsible for the death of the individual. The importance of this statement lies in the fact that the earlier the cardiac changes are recognized by the clinician, the less will be the damage to the myocardium, and the more perfect the "restitutio ad integrum." It is advisable to determine, if possible, in our hyperthyroid cases when we are dealing with a cardiopathic type, so that the necessary steps may be taken to correct the condition before the myocardium is permanently damaged.

True thyroid heart decrease manifests itself by an enlargement of the heart, auricular fibrillation or congestive heart-failure, rhythmic or arrhythmic.

Auricular fibrillation is the most frequent form of arrhythmia in toxic thyroids. It occurs with both exophthalmic goiter and toxic adenoma, with a slightly greater incidence in the latter. It may appear early in the disease, or later when myocardial changes are more pronounced. In the early cases it is, as a rule, paroxysmal, lasting for a few hours or days with very irregular intervals of freedom. Thus, intermittency in the arrhythmia

should make us more careful in our examination of these cases for a possible hyperthyroidism. The attacks gradually become more pronounced and more frequent until they become fixed or permanent.

The condition of auricular fibrillation may be classified into: 1. Constant auricular fibrillation. 2. Intermittent auricular fibrillation. 3. Transient auricular fibrillation.

Its appearance as a fixed state is evidence of cardiac damage. It indicates a high degree of toxicity and extended duration of the disease, but may persist for years before it results in congestive heart-failure. Occurring more frequently in cases over forty years of age, it is almost invariably associated with all toxic thyroid states in patients over fifty years of age. It occasionally is induced by and exists for a short period after thyroidectomy.

This condition in contradistinction to the fibrillation due to other causes tends to show a resistance to digitalis and rest, and this fact may serve as a differentiating point. The pulse-rate may be little influenced by large, even toxic doses of digitalis, the arrhythmia not at all. However, there is definite evidence of markedly beneficial results following use of the drug, seen chiefly in the general response of the patient.

These cases occasionally resume a normal rhythm spontaneously, or following simple remedial measures such as rest, change of environment, etc. We have seen cases respond to Lugol's solution with a normal rhythm only to develop an abnormal rhythm following sudden severe strain, shock, and fear of operation. In the majority of cases the fibrillation is a fixed matter, and responds satisfactorily only to surgical removal of the gland or the offending adenoma.

All cases of auricular fibrillation which cannot be accounted for on the basis of existing pathology in the heart should make us definitely suspicious of an underlying thyroid basis. The signs of toxic goiter may be slight and completely overlooked, particularly in the so-called "formes frustes" types; exophthalmos is an indefinite sign; adenomata may be small, central, substernal, difficult to palpate, and, unless we are

careful in our clinical study of the case, may escape our observation. Our attention should be directed to the accompanying nervousness, loss of weight, sympathetic manifestations, sweating, blushing, peripheral pulsation, etc. A basal metabolic reading with its associate, a sugar tolerance estimation, will usually serve to make the diagnosis.

Other types of arrhythmia are found in hyperthyroidism. These, likewise, are either paroxysmal or permanent: 1. Auricular flutter is said to be due to toxic thyroid in a large number of cases. 2. Premature contractions. 3. Sinus arrhythmia as mentioned above. 4. Paroxysmal tachycardia.

In addition to the disturbances of rhythm there are also found disturbances of conduction. Among these are the following: 1. Sino-auricular block. 2. Delayed auriculoventricular conduction. 3. Aberration of Q. R. S. complexes in all leads of the electrocardiogram.

Congestive heart-failure, the third sign of thyroid heart disease, may or may not be associated with auricular fibrillation. Hamilton⁴ reports that of 50 cases of congestive heart-failure 39 showed a persistent auricular fibrillation. It may and often does occur as a terminal state, though it is rather remarkable how quickly relief comes following the removal of the gland in these cases so that an apparently hopeless case of cardiac decompensation is, in a relatively short space of time, converted into a fairly normal case without edema, breathlessness, cough, hemoptysis, or the other associated signs of heart-failure. The change is frequently startling, and it is with the hope of this remarkable result from proper therapy that we advocate the early differentiation of this type of case.

The positive evidence of congestive heart-failure differs in no way in these cases from that associated with heart-failure due to one or other of the more common causes of cardiac disease. The underlying physiologic-pathologic principle is the same. The myocardium, which is failing, has as its concomitants and results certain symptoms related both to the lesser and the greater circulation, these varying in intensity with the degree of decompensation. The onset of the cardiac failure depends in

some measure upon the underlying cause of the hyperthyroidism. In toxic adenoma the tumor may appear between fifteen and twenty years of age, symptoms of hyperactivity appear about fifteen years from the time of appearance of the adenoma, cardiac failure appears from five to eight years after the onset of symptoms. It is this continued hyperthyroidism, a toxemia operating over a long period of time, which is responsible for the more marked cardiovascular change in these cases. The symptoms appear with greater incidence in females over forty-five years of age.

In exophthalmic goiter the symptoms come on rather suddenly at an earlier age (between thirty and forty) likewise more commonly in females, the total duration of the symptoms being about one-third of that in toxic adenoma. In both states the usual clinical symptoms are present, but to a slightly greater degree in exophthalmic goiter. Pigmentation of a diffuse brownish character may be present in both; hypertension is more pronounced in the toxic adenoma type, while the basal metabolic rate is higher in the exophthalmic type.

We have stated that the clinical picture of congestive heart-failure in thyroid states is practically identical with that seen in other conditions, and frequently there is difficulty in differentiating the two types. Significant points which should be taken into consideration in the history of these cases are the following (Hamilton⁴): 1. Sudden onset of cardiac failure, particularly in the exophthalmic type. 2. Regular attacks of cardiac failure of few days duration, with intervals of a few days or weeks, and with continued disorderly action of the heart. 3. History of prolonged cardiac failure in that type of case which presents very early evidence of cardiac damage, and which is frequently classified as heart disease, and constantly considered such with little attempt to study possible thyroid relationship.

The basal metabolic rate is of value in the differentiation of these conditions, but caution must be exercised in the proper interpretation of elevated rates. In simple congestive heart-failure the basal metabolic rate may be elevated 25 to 50

per cent. Willius and Boothby³ report that the average basal metabolic rate in exophthalmic goiter is +44, while in toxic adenoma it is +33. In the congestive heart-failure of toxic thyroid states, the average of a large series of cases (Hamilton⁴) is given as +61.8 per cent.

The pulse and its response to treatment may serve as a differentiating factor. It is usually rapid, sometimes reaching 180 to 200 beats per minute, extremely irregular with an existent fibrillation. The response of the pulse to digitalis and rest is much the same in the decompensated thyroid hearts with auricular fibrillation as in the compensated auricular fibrillation cases, and it may be said that cases of heart-failure with auricular fibrillation, that fail to show an adequate pulse response and also a general clinical response to digitalis and rest, are probably due to hyperthyroidism, although a slowing of heart rate in the same cases does not necessarily exclude an underlying hyperthyroidism.

Other points of differentiation may lie in the existence of the nervous symptoms, pigmentations, marked loss of weight, etc., as mentioned above.

In conclusion I would like to stress the following points in the relation of the heart to hyperthyroid states:

1. Persistent tachycardia (120 to 160 beats per minute) not responding to the usual treatment for tachycardia, due to organic cardiac disease.

2. Increased force of the heart-beat with the vascular phenomena, the elevated blood-pressure, the increased pulse-pressure, the associated systolic murmurs, and the differentiation from mitral stenosis and aortic regurgitation.

3. True cardiac disease, manifested by enlargement of the heart, auricular fibrillation, congestive heart-failure, and the relatively greater frequency of these conditions in toxic adenoma.

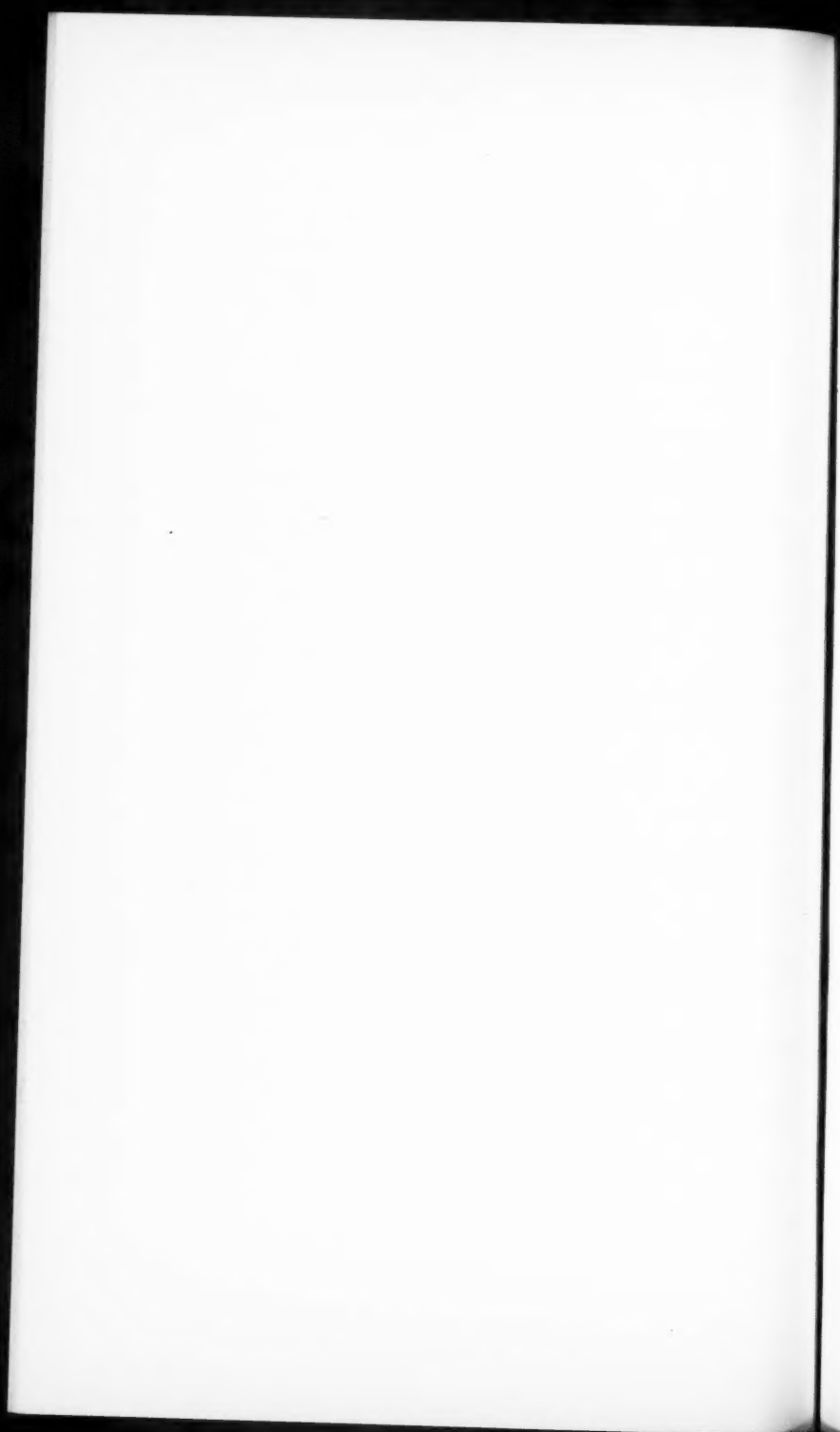
4. Importance of paroxysmal auricular fibrillation and paroxysmal tachycardia as early signs of hyperthyroidism.

5. Differentiation of the thyrotoxic auricular fibrillation and congestive heart-failure from the simple auricular fibrillation and congestive heart-failure. The importance of an early diagnosis.

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CLINIC OF DR. JAMES F. McFADDEN

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BRADYAPNEA OR TRANSITORY BILATERAL VAGUS PARALYSIS IN TABES DORSALIS

C. L., male, thirty-seven years, single, laborer, unconscious at time of admission to the hospital. There was marked cyanosis, the body was cold and there was extreme respiratory embarrassment, there being one deep inspiration every fifteen or twenty seconds. The respirations were abdominal in type and at times there was some hiccough.

One evening the patient went to his room feeling quite well. He slept well, and was very much surprised upon awakening in the hospital, twenty-four hours later. He was found in his room that morning, in the above described condition. The temperature was subnormal, blood-pressure 98/66, and the respirations were four per minute. The maximum pulse rate was 132 with a minimum respiratory rate of two per minute. Catheterization yielded 6 ounces of urine which was normal to laboratory tests.

Six hours after admission the patient regained consciousness, but was somewhat irrational for one and one-half hours longer. The following history was obtained.

Chief Complaint.—1. Pains in back, occasionally extending to the lower extremities. 2. Difficulty in controlling the lower extremities. 3. Incontinence of urine. 4. Dizziness at night. 5. Insomnia. 6. Sexual impotence. 7. Nervousness.

Onset.—The impotence was of ten years' duration. The other symptoms were of sudden onset, and of three years' duration. While running a wheelbarrow down an incline, his lower extremities suddenly became stiff, making it necessary for him

to drag them when attempting to walk. Since this occurrence his lower limbs have not been reliable, and he has only been able to stand with the aid of a cane or by holding on to some support.

Since the onset he has suffered a continuous dull ache in the back and lower extremities almost continuously with occasional sharp "flash-like" pains. The severity of these pains was not affected by time, atmospheric conditions, exercise, or rest. The inability to use his lower extremities to advantage is well put in his own words, "When I call upon them to perform their functions they are not there."

For three years he has experienced no desire to urinate, but there has been an almost constant dribbling. At times he was able to void, but with "drops and jerks with much difficulty." The dizziness occurs only when in the dark. The insomnia has been caused by the almost constant pain.

Family History.—Father and mother both sixty-five years of age and well. Two brothers died in early childhood. Three sisters dead, two living and well. Cause of death of brothers and sisters not known. No family history of neuropsychiatric conditions.

Personal History.—Typhoid at twelve years, no complications or sequellæ. Primary luetic lesion and Nisserian infection at seventeen years. At twenty-seven years he noticed that his upper teeth were becoming loose. He was able to extract them one to three at a time, with no pain. From the onset of his trouble he has taken much antiluetic treatment, including twelve injections of salvarsan, sixty intramuscular injections of mercury, and one intraspinal injection of mercurialized serum. He has smoked thirty to forty cigarettes daily, and has used alcoholics to excess. He denied the use of narcotics. Whenever he has used purgatives he has experienced fecal incontinence.

Neurologic Examination.—Gait markedly ataxic with widening of the base, unable to walk with eyes closed or upon looking upward, marked Rombergism. Pupils unequal, irregular, fixed to light, and sluggish to accommodation. All tendon reflexes absent. Abdominal reflexes active and equal. Left cremasteric reflex absent, right responds slightly. Vibratory sense dimin-

ished from eighth to twelfth dorsal segments, below this absent. Sense of position absent in lower extremities. In girdle region pin-prick felt as a "stinging sensation" and a scratch as a "burning." Hypalgesia over lower extremities and delayed response more marked in soles of feet.

Spinal Fluid.—Pressure increased, cell count 30, globulin positive, Wassermann doubtful, blood Wassermann negative.

After a course of mercury and iodids, the patient improved sufficiently to be able to walk without a cane or assistance. He was discharged as improved.

Second Attack of Bradyapnea.—Five months after the first attack the patient was readmitted. At this time he regained consciousness with a return to normal temperature, pulse, and respiration within fifteen minutes after he arrived in the receiving room.

Third Attack of Bradyapnea.—Four months after the second attack the patient had a third one with subnormal temperature, rapid pulse, and very slow labored respiration. The temperature gradually returned to normal within forty-eight hours. The pulse and respiration fluctuated upward and downward throughout this period. The maximum pulse-rate was 140 per minute, but the respirations never became less than twelve. This episode was somewhat different from the previous ones. During the former attacks there was a gradual return to normal temperature, pulse, and respiration. On the last admission after the initial bradyapnea and tachycardia the pulse ranged irregularly from 76 to 140, the respiration increased with the pulse, ranging from 12 to 36, and the temperature from 94 to 104° F. There was not a normal proportion between temperature, pulse, and respiration. At times the patient became restless and noisy. These periods were when the temperature was subnormal or normal, therefore not a fever delirium.

The patient died thirty-four hours after admission to the hospital. Shortly before death temperature was 98.8° F., pulse 112, respiration 28.

Autopsy was not permitted.

Discussion.—This case was at one time diagnosed as taboparesis. The argument for such a diagnosis was that there was

a speech defect, a transitory period of unconsciousness, and retarded mental responses with possible deterioration, all of which suggested paresis. The Argyll-Robertson pupils, lancinating pains, sensory disturbances, and absent tendon reflexes suggest tabes.

It is a better diagnostic procedure to make one disease entity account for all of the signs and symptoms whenever possible. Taboparesis cannot be considered as one, but as a combination of two disease entities.

There can be no reasonable doubt as to the correctness of the diagnosis of tabes dorsalis. Let us now present the evidence against general paresis. It is true that this man did show some disturbance in speech, but when carefully tested an experienced observer would readily conclude that it was not a paretic speech. It was merely the usual speech difficulty one encountered in those who have had their teeth extracted. The examination revealed that there were no teeth remaining in the upper jaw. The history tells us that some years ago the upper teeth became loosened and were easily and painlessly removed by the patient. This is not an infrequent occurrence in tabes.

As to the mental retardation and deterioration, we were unable to demonstrate any marked differences in his mental responses from those of the average man in his walk of life. It must also be considered that there is a history of chronic alcoholism which in itself is quite capable of causing mental deterioration.

The periods of restlessness, excitement, and delirium were not unlike those seen in alcoholism. While it is true that transitory unconscious periods and convulsions occur in paresis, none of these periods could be classified as convulsions for at no time was there a convulsive moment, and the non-convulsive unconscious episodes of paresis do not show the vagal symptoms such as were found in this case.

Every sign and symptom elicited have been found in tabetics, although some of them cannot be classed as occurring with any great frequency. The bradyapnea, tachycardia, and subnormal temperature, which can be interpreted as the syndrome of bi-

lateral vagus paralysis, is rare. A careful search of the literature discloses only 5 such cases as having been reported. F. Hoover of Cleveland, Ohio, in 1907 reported three. Allen Jones of Buffalo, N. Y., in discussing Hoover's cases spoke of having had one similar case. In 1899 Egger of the Salpetriere reported 1 case of bradyapnea in tabes, which he considered bilateral vagus paralysis.

The cases of both Hoover and Jones had apnea, not bradyapnea, and it was necessary to resort to artificial respiration for a number of minutes to sustain life until automatic respirations commenced. In 3 of their 4 cases an injection of morphin provoked the attacks. Hoover, in discussing 2 of his cases, states, "Both of these patients showed respiratory center involvement thirty to forty minutes following the administration of morphin. This is the time usually elapsing between the administration of morphin and maximum respiratory depression in animal experimentation. . . . Both were in a period which marked the transition from symptoms of excitation to symptoms of depression. There seemed to have existed a depression of cellular response of the respiratory center, though insufficient to cause any symptoms. The added depression effect of a small dose of morphin sufficed to cause hypesthesia of the respiratory center and precipitated the attack of apnea."

My patient did not have morphin prior to these attacks, but the fact that he was a chronic alcoholic may have some bearing, causing an attack by the depressing effect of alcohol.

It is of interest to note, however, that during one of his hospital visits, he was given some morphin and experienced no untoward effect.

Gad and Marckwald by freezing both vagi in a dog procured a bradyapnea of three to four per minute.

In conclusion let us remember: 1. Any nerve may be involved in tabes. 2. Be careful in prescribing depressants. 3. Do not diagnose paresis on the speech defect and mental deterioration when there is evidence to explain them as of mechanical and toxic origin. 4. You are more likely to be correct if accounting for all signs and symptoms by one disease entity.

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JUVENILE PARESIS

J. L., age twelve years, was brought in by her parents, who stated that she was not progressing well in school. They seemed quite anxious to determine the cause of her retardation, even though they seemed of the opinion that she was a mental defective. She had been taken to several doctors. The concensus of opinions was that she was "just nervous," and if sent to a boarding school would probably outgrow the nervousness.

Family History.—The father stated that he has suffered very much with rheumatism, but denied having had any type of venereal infection. He had a peculiar pale appearance, of the type frequently seen in chronic luetics. The mother appeared to be well nourished, strong and healthy. She stated that she has always been well. There was no history of miscarriages. Two children resulted from the union; the first being our patient and the second a girl two years younger. This second child was born and developed normally and, at the time seen, she was one year ahead of her sister (the patient) in school.

Personal History.—Birth was normal. She teethed, walked, and talked at the usual ages for a normal child. She progressed normally, entering school and progressing as an average child until the age of ten years, at which time she showed a somewhat irregular reaction toward her school work. At times she would display a lack of interest in her studies and recitations. Again she would have periods of apparent normality. Occasionally her responses to questions would be irrelevant. Frequent emotional outbursts occurred both in school and at home. The indifference and emotional episodes became more frequent, resulting in failure to advance with her class. During the ensuing two years she was placed in other schools, but of no avail, for instead of progress there was a decided retrogression. Finally the parents realized the futility of her remaining in school, and kept her at home. Usually she was quiet and orderly about the

home, but there were days when she would become noisy, hyperactive, and quite bizarre with no apparent provocation. She had several periods of transitory paralysis of the right arm, forearm, and hand, lasting for from fifteen minutes to a few hours. These were sometimes accompanied by motor aphasia.

Physical.—The general physical examination showed nothing worthy of note with the exception of a doubtful murmur over the aortic region, and typical Hutchinsonian teeth.

Neurologic Examination.—As the patient appeared for examination, the examiner's attention was first attracted by a marked speech disturbance. The speech was quite typical of that elicited in adult paresis. This was so pronounced that the diagnosis seemed certain and further examination unnecessary except as a confirmative measure. There were tremors of the tongue and facial muscles, especially those around the mouth. The pupils were irregular and unequal, and failed to respond to light. The tendon reflexes were more active on the right.

Mental.—The mental reactions were somewhat irregular. At times questions were answered fairly well. Again the same questions would produce an irrelevant response. It was impossible to do a formal mental, or a psychometric test. At times she would show an undue emotional response with no adequate stimulus; while at other times there would be no emotional response when normally one would be expected.

Laboratory Tests.—Blood Wassermann + + + +. Spinal fluid Wassermann + + + +. Cell count, 80. Globulin +.

Remarks.—The parents were apprized of the diagnosis, etiology, prognosis, possible treatment, and of the necessity of a careful examination of the father, the mother, and the sister.

This case is now being treated by the family physician, but the prognosis must, of necessity, be very grave.

Discussion.—At the present time, much is being said and written about mentally defective children. The schools, courts, clinics, and other agencies are devoting much time and effort to this subject as well as to the delinquencies resulting from the same. Practically every doctor, from time to time is confronted

with the mentally defective child, and the main point of issue is the prognosis. It is, therefore, quite necessary for the practitioner to be in a position to recognize the mental abnormalities which are often confused with feeble-mindedness. Such a disease is juvenile general paralysis.

While this disease is not common, it cannot be considered one of the rarest mental afflictions of childhood. The first reported case is credited to Clauston in 1877. Since that date, only a few over 300 cases have been reported in the literature. These, however, do not constitute the total number of cases, because undoubtedly many pass unrecognized, and are tabulated in statistical reports as mental defectives, or merely as congenital syphilitics.

Etiology.—The finding of spirochetes in the brain cortex fixed the etiology of paresis. There remains one question in juvenile paresis which applies to heredosyphilis in general, that is, the one of third generation syphilis. The French accept third generation syphilis as possible, while other observers report with or without reserved judgment.

Age.—The age of onset, generally speaking, may be computed to be about the same number of years following birth, as is represented in the adult form by the time between the initial infection and the onset of paresis. Cases have been reported as young as from four to six years. Some authors report heredoparesis as having occurred in adults. The greater number of cases occur at about the fourteenth, fifteenth, and sixteenth years.

Sex.—Some report that it is found more frequently in girls than in boys. Other observers have it as equally divided. This is not consistent with the adult type which is much more frequently found in the male.

Duration.—Periods of remission are seldom seen. The actual duration from onset to death is longer than in adults.

Mental Manifestations.—Usually rapidly progressing dementia with emotional instability. The delusions are not as prominent as those in the adult type, but the child may become fearful and this may be interpreted as a possible reaction to delusions. In spite of statements that megalomania does not

occur in juveniles, a number of cases have been reported in which definite grandiose delusions were present.

Physical Manifestations.—If a sufficient number of cases are studied, practically all of the physical signs of the adult paretics can be found in juveniles. The usual ones are speech disturbances, tremors, Argyll-Robertson pupils, transitory paralysis, and inequality of tendon reflexes.

Termination.—Usually a general weakened state, abolition of mental processes, often ending in a convulsion in which the patient dies.

Laboratory Tests.—The blood and spinal-fluid findings are of chief importance.

Prognosis.—Generally unfavorable, although some claim to have had better results in treating the paretics than in other forms of heredosyphilis, provided they can get the cases during a very early stage.

NEUROPSYCHIATRIC MANIFESTATIONS OF BROMISM

Case I.—Mrs. M. R., age sixty-three years, entered the hospital for treatment of sacro-iliac arthritis. Aside from the evidence of arthritis, the general physical examination was negative. She had some difficulty in sleeping and 30 grains of triple bromids were given the first night, 60 grains the second, and 60 grains the third.

A neurologic examination on the fourth day: large pupils, which reacted very slightly to light; the patient had had transitory diplopia during the previous few days; the tendon reflexes of the upper extremities were diminished; otherwise normal.

The laboratory examination showed a negative blood Wassermann, and an apparently normal urine.

Sodium bromid was given, 30 grains three times daily for one week, at the end of which time psychotic symptoms were noted.

When seen at this time the following was elicited: She had been somewhat restless for two days with some disturbance in memory, and, at times, a semidelirium. Psychiatric examination revealed disorientation, and mild delirium in which she had auditory hallucinations thinking she heard voices of relatives who were not present. She was dull, apathetic, and there was a noticeable lack of facial expression.

The neurologic findings were the same as given above.

The case was diagnosed as a toxic psychosis. In searching for a cause it was noted that she had been receiving bromids. Others on the case felt that she had not been getting sufficient amounts to cause psychic manifestations, because, in a vast majority of patients receiving bromid medication, much larger doses over a more prolonged period have not caused such a disturbance.

The bromids were discontinued and treatment for bromism was instituted with the result that the mental symptoms subsided, and within a few days her mental reactions were normal.

Case II.—Mrs. L. S., age forty-one years.

Present Illness.—Commenced two months ago with dizziness and staggering to the right (attributed to hot weather). There was an increased irritability and nervousness. Her speech has been affected for the past three weeks. Frequently she would fall asleep while entertaining others. Throughout this time she felt that others were against her. This feeling has increased recently. Four days ago, while visiting her mother, it was noticed that she talked incoherently, staggered to the right when walking, and during a conversation she fell asleep. On the same evening she drove her car into a fence. At midnight she went into her yard, unclothed, looking for an insurance agent. The day before admission to the hospital she developed severe pains in the lower abdomen. These pains were only relieved by urination, and became progressively worse up until the time of admission, at which time she was unable to urinate voluntarily. The pains were relieved by catheterization.

Family History.—Mother living, has had a right-sided hemiplegia. Father is living, has severe nephritis and ascites.

Personal History.—Usual childhood diseases, influenza four years ago, has had chronic cough for years, chronically constipated. Married five years, one child four years of age and well, no miscarriages, husband died two years ago of an acute cardiac condition. Since the death of her husband she has been very much upset and quite nervous. She has been taking bromids for this nervousness. Her brother states that she has been taking bromids in very large amounts. In his words, "As much as she could get."

For the past two years she has had polyuria fifteen to twenty times during the night, and many times during the day. Menstrual flow has been normal up until the onset of the present condition. Now menses occur every two or three weeks, they are profuse, and attended by very much pain. She has lost weight recently.

Physical.—Thin, poorly nourished, face flushed and soggy, postules over back and chest, spleen enlarged to percussion, otherwise general physical examination is negative.

Neurologic Examination.—Right pupil is larger than the left, both respond normally, ophthalmoscopic examination negative, right biceps reflex is absent, other reflexes of the upper extremities are absent. Knee reflexes normal and equal. Achilles reflexes decreased, but equal. Abdominal reflexes absent, muscle twitchings, gait unsteady, staggering both to right and left, with a tendency to fall backward. Sensory examination cannot be made on account of the patient's mental state.

Psychiatric Examination.—Disoriented, marked confusion with tendency to ramble in an incoherent manner. Delusions of persecution, does not sleep soundly, but seems in a low muttering delirium, restless, and picking at bed clothing. At times when attention can be gained, she responds fairly intelligently, and her memory for past events appears fairly good. Test phrases repeated, but at times there is some mumbling. There is a lack of expression of the face, and emotional tone is not in keeping with the surroundings.

Differential Diagnosis.—The admitting physician suspected this to be a case of general paralysis of the insane, because of the pupillary inequality, lack of facial expression, disturbed reflexes, apparent speech defect, mental reactions, and history of failing mentality.

This, however, can be excluded when one finds that the speech disturbance, was not typically paretic, but of the type one finds in delirium or intoxication. The Wassermann reaction was negative in both blood and spinal fluids. The history was negative for lues.

The mental state is quite characteristic of a toxic delirium or psychosis. The presence of pustular eruptions over the body, and the history of the excessive and prolonged use of bromids indicate bromism.

Under treatment the symptoms subsided, and in a short time the patient recovered completely.

Case III.—This case will be outlined briefly as there are no records at my disposal. It was seen during military services in the World War. A young aviator had fallen from his plane

fracturing his skull. While in the hospital he was progressing nicely when one day he became delirious, and it was difficult to prevent him from injuring himself. A neurologic consultation was requested, thinking that it was going to be necessary for a decompression operation to relieve his symptoms. The consultant was of the opinion that the patient was receiving too much bromid. He recommended a discontinuance of the same. The patient became more quiet and rational, later recovering completely, and without operative procedure.

Discussion.—In bromid therapy it must not be overlooked that bromid salts are stored up in the body, and that bromin retention with chlorin excretion really brings about bromin poisoning. When the body tissues become poor in chlorin, and the heart and kidney functions are not active, bromid intoxications appear.

Acute poisoning may occur from a single large dose. The symptoms are profound depression, or apathy, or even a stupor which may last for several days.

The mental manifestations of bromism are characterized by psychic deterioration in which the patient is dull, stupid, and apathetic. The attention and retention, as well as the judgment and the association of ideas, become greatly impaired. A typical delirium often develops. Speech may be disturbed. Active hallucinations, delusions, and dream-like experiences are prominent, and are mostly of a persecutory and terrifying nature. The mood is variable, usually depressed, but may be euphoric. If the attention can be gained, the response is often unusually good.

Bromism occurs more frequently in those of neurotic and unstable make-up.

The face is without expression and pale, and usually bears diffuse papules; voluntary movements are sluggish.

The general excitability of the nervous system is greatly lowered. There may be marked emaciation and weakness bordering on collapse, pains in head and legs, acneform eruptions, occasionally severe eruptions and gangrene; habitual constipation, poor appetite, even nausea and vomiting, foul breath, coated tongue, and sordes. Circulatory disturbances evidenced

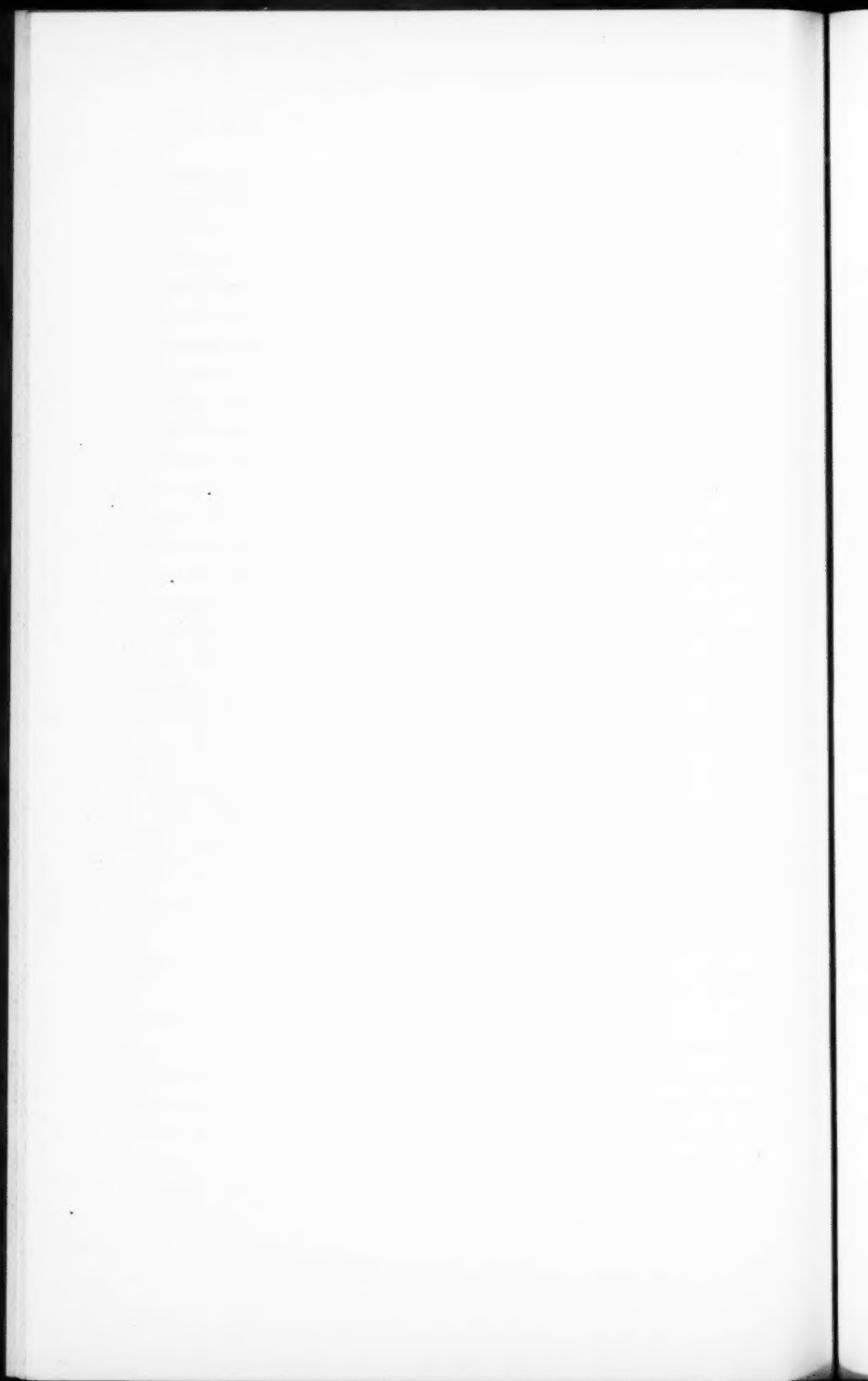
by weakness and lowering of tension; genito-urinary disturbances, renal disturbances, retention or diminution of urine, menstrual irregularities, and lowering of sexual functions.

The neurologic manifestations are marked ataxia; tendon reflexes almost always changed, usually exaggerated, unequal and irregular ankle-clonus, pseudo-ankle-clonus, and Babinski have been observed. Tremors of hands, face, tongue, and other parts. The whole body may be tremulous. The pupils are frequently dilated, may be contracted, are often irregular and unequal. Most always the light reflex is either sluggish or absent. The speech is thick and indistinct. Sensory anesthetics, paresthesias, and hyperesthesias may occur.

Treatment.—Bromids are rapidly eliminated through the urine. The administration of chlorids tends to hasten the excretion of the bromids. Stop the drug, hasten elimination, push intake of sodium chlorid, ingestion of large volumes of water, careful diet, caffeine or strychnin to counteract the depression.

Judging by the amount of space allotted to this subject in text-books, one would be inclined to believe that it is a rare complication. In looking through ten different text-books, only four considered the subject and then only in a cursory way, perhaps one or two paragraphs. One gave about one page.

It is my opinion that this condition occurs more frequently than is supposed, but it is not recognized. The possibility of bromid delirium should always be borne in mind. The average physician does not appear to realize the possibility of acute or chronic poisoning that the prescribing of this drug presents.



EMBOLIC HEMIPLEGIA COMPLICATED BY EMBOLISM OF PERIPHERAL ARTERIES

Case I.—J. A., male, forty-five years, laborer, admitted to hospital, conscious, but unable to answer questions, entire right side of body paralyzed. It was impossible to obtain a history as the patient had a motor aphasia. General examination was negative, with the exception of the cardiovascular and neurologic systems.

The heart was enlarged to the left and downward, apex-beat sixth interspace, and heaving in character, strong systolic murmur at apex, transmitted to the axilla. The heart-beat was irregular, many beats failing to come through to the radial pulse. Blood-pressure 125/80.

Neurologic Examination.—Pupils reacted only slightly to light, right slightly larger than the left. Forehead wrinkled more on left than on right, right palpebral fissure wider on right. In showing teeth, mouth drawn more to right, tongue protruding to left, spastic paralysis of right arm and leg, atrophy of small muscles of right hand. Reflexes of upper extremities increased, right more active than left, knee and achilles reflexes more active on the right. Chaddock reflex positive on right, slight right patellar clonus, right cremasteric reflex very slight, left active. Abdominal reflexes absent excepting in the left upper quadrant which is slight.

At time of entrance the patient had motor aphasia. This condition gradually improved until the patient was able to hold a monosyllabic conversation. Speech never returned completely to normal. He stated that this condition had existed for one month prior to admission.

A friend visiting the hospital stated that this condition commenced three months prior to admission. There was a numbness in right foot, later the hand became involved. There was cyanosis of finger- and toe-nails of the right side, he had

some pain in the left chest, and shortness of breath; he complained of tinnitus and vertigo. The friend stated that the patient had a venereal disease six years before.



Fig. 65.—Case of embolic hemiplegia complicated by embolism of peripheral arteries. Typical dry gangrene of left foot, with sharp line of demarcation.

Diagnosis.—Embolism, probably of the left lenticulostriate artery, causing right hemiplegia and motor aphasia. This con-



Fig. 66.—Same case as Fig. 65, showing tendency of process to move upward.

dition improved slowly until a few weeks after admission when the patient experienced a numbness of the left foot; it was more cyanotic than the right; there was no pulsation of the dorsalis

pedis artery on the left. This foot gradually became discolored and developed a typical dry gangrene with a sharp line of demarcation as shown in Fig. 65. This showed a decided tendency to move upward as is shown in Fig. 66, until it reached above the ankle. Amputation under spinal anesthesia. A few days later



Fig. 67.—Same case as Figs. 65 and 66. Left foot just prior to amputation

the temperature increased and within two weeks he died of pneumonia. Autopsy was refused. Blood Wassermann was positive and the urine was negative. Fig. 67 shows the foot just prior to amputation. There is a typical dry gangrene.

Case II.—H. S., female, twenty-one years. First admission to the hospital for septic abortion; two months later returned with chronic salpingitis, and cystic ovary was removed. On first admission blood Wassermann was positive, on the second it was doubtful. At both times the heart was reported as normal. Fifteen months later she was returned to the hospital with paralysis of the right arm and leg, and motor aphasia.

A history obtained from her landlady and her employer was as follows: On the day of admission she had gone to her work as usual. She stopped for something to eat. She ordered ice-cream, but when it was served she stated that it was not ice-cream. She was taken to the rest-room where she became very restless. Upon being taken home she became more restless and

irrational. She walked with a slight limp, and could talk at this time. Before her arrival at the hospital she had a complete motor aphasia. The patient was at no time unconscious.

Family and personal history said to have been negative.

Examination was negative excepting for the heart and nervous system. There was a slight increase of cardiac dulness to the left and a loud systolic murmur at the apex, not transmitted. Pulse was regular, 80 per minute, temperature 100.6° F.

Neurologic Examination.—Flaccid paralysis of right arm and leg, supraorbital muscles weaker on right, right eyelid did not close tightly, slight ptosis of right eyelid. Pupils regular, right larger than the left, both reacted to light and accommodation. Mouth drawn markedly to the left, tongue protruded to the right. All tendon reflexes were more active on the right, bilateral Babinski reflex. Abdominal reflexes could not be elicited. There was hypesthesia over the entire right side of the body.

Urine negative, blood Wassermann positive.

Under antiluetic treatment the patient improved, was able to move arm and leg, and the aphasia gradually receded.

On the eighteenth day she complained of a severe pain in the left hypothenar eminence and little finger. A very small, round, white spot surrounded by a pink margin appeared. The areola gradually became darker, and the surrounding tissues showed evidence of general inflammation. This first appeared in the hypothenar region and the following day one was on the little finger. Two days later there was a transitory dimness of vision accompanied by a soreness of the sole of the left foot. Ophthalmoscopic examination was negative. The area under the foot was similar to the ones on the hand. One such area was removed, and microscopically showed endarteritis, thrombosis, miliary vascular abscesses, and edema. The blood-cultures showed no growth in seventy-two hours. Throughout, the patient ran a "toxic" temperature.

The tissue about the areas described above became ecchymotic, and then gradually returned to an apparently normal state with relief of pain.

The aphasia cleared up completely. The hemiplegia grad-

ually disappeared, until the patient was able to get around with only slight assistance, at which time her parents took her from the hospital.

At time of discharge the heart pathology and temperature remained the same as above described.

Discussion.—As hemiplegias and aphasias, these cases are no different from many others. They are, however, quite interesting from the point of etiology and complications. Both were luetic, and showed definite cardiac lesions which apparently must have preceded the cerebral symptoms.

Apparently we had endocarditis with embolus lodging in the lenticulostriate artery causing a hemiplegia. Later there was a similar occurrence, but affecting the vessels of the leg in one, and of the hand and foot of the other patient.

Although both patients had positive Wassermann reactions and appeared somewhat similar, they differed quite markedly. Case I had no elevation of temperature until the terminal pneumonia. It was probably a luetic endocarditis with cerebral and peripheral embolism. Case II ran an irregular temperature throughout, had a past history of septic abortion, therefore must be considered a case of septic endocarditis with cerebral embolism and peripheral septic purpura, due to emboli, even though the blood-culture was negative.

Lues may be considered as a contributing cause, as the pathologic specimen showed some endarteritis of a luetic type.

Cases as described above are infrequent, and even then have not been reported. None was found in a review of the literature for the past eleven years and no references were seen in the textbooks at my disposal.

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CLINIC OF DR. O. P. J. FALK

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THE DIET PROBLEM IN CHRONIC BILE-TRACT DISEASE

RECENT developments in the experimental and clinical investigation of bile-tract physiology have thrown considerable light upon the effect of diet on biliary tract function, and given us a more definite indication as to the rational dietetic management of chronic cholecystitis, with or without cholelithiasis, than we have hitherto possessed. From a perusal of the literature and association with clinical hospital work, the trend seems to have been to favor frequent feedings of a diet very low in fat, limited in protein, and high in carbohydrate content.

The underlying reasons for this almost traditional management of diet in bile-tract disease, apparently have been based upon the following theories:

1. That the gall-bladder contracts and empties with more or less efficiency depending, of course, upon the presence or absence of chronic infection, thickening, adhesions, duct obstruction, etc., after each ingestion of food, no matter whether carbohydrate, protein, or fat.

2. That a fat-free diet in general would reduce the cholesterol content of the blood, and be more compatible with the disturbance in cholesterol metabolism that is so frequently associated with the formation of gall-stones in chronic gall-bladder disease.

3. That a fat-free diet would combat the tendency toward obesity seen in so many gall-bladder subjects.

4. That fat is a recognized irritant to the duodenum, causing duodenal contractions, which stimulus is conveyed to the sphincter muscle round the opening of the common duct, and thence to the biliary tract mechanism, involving especially the common

duct and gall-bladder proper. There seems to be a tendency to consider this stimulation as a source of undesirable irritation, and therefore contraindicated in the presence of chronic inflammation or gall-stone formation.

Reconstruction of our ideas on gall-bladder and bile-tract response to food is needed, in the light of recent investigations, and would seem to warrant the following practical conclusions:

I. BILIARY TRACT RESPONSE TO FOOD

It is probably true, that, in the presence of frank cholelithiasis, fats would be a source of gall-bladder irritation, and possibly precipitate gall-bladder colic by forcing concretions into the common duct. However, in chronic cholecystitis without evidence of stones, or in the absence of frequently recurring stone colic, it would be rational to provide some sort of a fat in the diet as would cause maximum contractions, and hence more efficient emptying, thereby minimizing stasis in the gall-bladder. This has been shown by the recent investigations of Whitaker¹ and Boyden.² The former first noted the effect of food, and especially fat, in emptying the human gall-bladder during his observations while working with cholecystograms at the Peter Bent Brigham Hospital.

Their work has shown that there is considerable evidence against the theory that the mere flow of bile from the liver empties the gall-bladder. After administration of bile salts, which stimulate bile flow, a cholecystogram persists for the normal period. Also during fasting, although there is some discharge of bile into the intestine, a cholecystogram persists for days. Furthermore, it has been often noted that a cholecystogram becomes more dense as the gall-bladder empties, in spite of the smaller volume of opaque material. This indicates that the concentration of bile in the gall-bladder increases during emptying, which would not be possible if its contents were being "washed" out by a flow of bile from the liver. As they pointed out, iodized oil may remain in the gall-bladder of a fasting cat for days, sometimes without any evidence of the inflow of bile, and then, when fat is given there may be an uninterrupted outflow

of oil for from ten to fifteen minutes, the gall-bladder progressively decreasing in size.

The evidence points to the fact that the emptying of the gall-bladder is an active process, resulting from the contractions of the musculature of the organ. Whitaker has shown that the gall-bladder may empty so completely after ingestion of food that not a single drop of bile will drip from the lumen after the feeding of an emulsion of olive oil, the gall-bladder being collapsed in a state of marked tonus. He has, furthermore, observed in the gall-bladder of cats that an emulsion of olive oil injected intravenously will completely empty the organ within two or three hours.³

McMaster and Elman⁴ have obtained further evidence that emptying is an active process, by noting a marked increase of pressure in the gall-bladder following ingestion of food. Whitaker has observed the gall-bladder of a cat, containing iodized oil, fluoroscopically, and in many cases has noted it to elongate and contract when it began to empty, which was followed by a lifting of the heavy, viscid, iodized oil out of the gall-bladder, and forcing it into the cystic duct. After an hour or two of emptying, the active tubular organ would relax and revert to its original rounded shape. There does not seem to be any doubt, then, that emptying of the gall-bladder depends upon the activity of its musculature, and that this musculature is initiated into activity by fats more than by other types of food. Indigestible material, such as barium sulphate, or even a food, such as sugar or starch, has been seen by Whitaker to pass through the entire alimentary tract without affecting the gall-bladder in the least. When an animal was given bile salts by mouth, he observed the flow of bile into the intestine to be increased, the sphincter consequently being opened, but the gall-bladder, instead of contracting, is expanded with bile.⁵ This will serve to indicate the futility of giving bile salts in chronic gall-bladder disease, in the hope of increasing bile flow through the gall-bladder, although it might still be effective in chronic cholangitis.

The direct application of magnesium sulphate undoubtedly relaxes the sphincter, but it produces only a very slight emptying

of the gall-bladder, possibly because of the elastic recoil of that distended viscus, as has been shown by Silverman and Menville.⁶ Complete emptying comes only after taking food. Incidentally, these observations further make it evident that "non-surgical biliary drainage" by the intraduodenal injection of magnesium sulphate as a therapeutic measure in disease of the gall-bladder is a useless procedure.

Numerous workers with cholecystography have observed that after the ingestion of food the shadow of the gall-bladder increases rapidly in density as it decreases in size, in spite of the smaller mass of opaque material. Boyden and Whitaker have observed many times, when using their method of feeding cats and then killing them at various intervals of time, that, as the gall-bladder empties, its bile becomes progressively darker and more viscid, apparently more concentrated. Boyden has also shown that, as the viscus empties, its mucosa is thrown into folds somewhat resembling those in the small intestine. This fact, taken in connection with the fact that as the gall-bladder decreases in size the ratio of surface to cubic content increases, would seem to indicate that a partly collapsed gall-bladder is a more efficient concentrating mechanism than a distended one. It is conceivable, therefore, that in any condition in which the gall-bladder is maintained in partial collapse and refilling prevented, concentration might go on to precipitation, and did so, as he has shown in his report.⁷

It is furthermore conceivable that an individual who eats too much and too often may reduce the efficiency of the musculature of the alimentary tract as a whole, and with it the gall-bladder, with a resulting stasis of bile in the vesicle. This overfeeding might also reduce the tonus of the common duct sphincter, along with that of the alimentary tract in general, preventing complete refilling of the organ, with further promotion of concentration. Such a process may provoke the formation of gall-stones.

There is little doubt that reactions to infection play a part in cholelithiasis, but this is not incompatible with the foregoing concept. We know from cholecystography that the diseased gall-bladder may have some power of concentration unless the

mucous membrane is destroyed, and we also know that disease of the wall of the gall-bladder inhibits filling and emptying. Thus the conditions favoring concentration and precipitation may be brought about.

The fundamental condition, then, to gall-stone formation is universally recognized to be stasis. Accordingly, in view of Whitaker's experimental observations, one of the factors in the prevention of gall-stones should be the effort to combat stasis by a proper dietetic habit. This should include not frequent feeding, but taking meals which are fairly rich in fat at long intervals. A person should be really hungry when he eats, which signifies that the tone of his alimentary canal and gall-bladder is high. When the meal is eaten under these conditions, the digestive organs attack it vigorously, and the gall-bladder empties itself in a few hours. The meal is promptly disposed of, and the gall-bladder rapidly refills with bile. Thus the organ is subjected to two or three good flushings daily, allowing little chance for precipitation or long-continued irritation by foreign particles (such as small stones and débris), which, even if present, can be expelled from the gall-bladder by this process.

II. THE QUESTION OF CHOLESTERIN METABOLISM

The principle of limiting cholesterin-forming foods is probably rational and proper. For, as Aschoff has shown, cholesterin stones are produced by precipitation from bile containing excessive amounts of this substance, which is secreted by the liver in excess during certain metabolic disturbances. The stasis induced by interference with the mechanism of the gall-bladder would favor this occurrence.

According to Rothschild and Rosenthal, the dietetic treatment in cases of hypercholesterinemia consists in diminishing the intake by using foods of low cholesterin content, and by rendering the absorption of cholesterin as difficult as possible by decreasing the lipid content and making difficult the intestinal esterization of the free cholesterin. A fat-free diet answers both purposes.

Foods rich in lipoids, to be excluded in hypercholesterinemia,

are: (a) Eggs, cream, butter, cheese, milk, meat, and fish (especially salmon, shad, and bluefish).

(b) Vegetables rich in phytocholesterin, consequently to be excluded, are beans and peas.

The strict, practically lipid-free diet is made up of vegetables other than those mentioned. Cereals, sugars, carefully skimmed milk, and fat-free buttermilk are allowed.

This strict diet is adhered to for three or four days during which the body is depleted of stored-up lipoids. The patient usually demands a change at the end of this period, and a more liberal diet is permitted for three or four days.

During the period of the liberal diet, in addition to the lipid-free menu the patient is allowed moderate quantities of well-cooked *lean* meat, and fish of any kind other than salmon, shad, or bluefish. Oleomargarin is substituted for butter. Olive oil is permissible.

The cholesterin of the bile is excreted in part by the hepatic cells, in part it is derived from the mucous membrane lining the gall-bladder, and the biliary passages (Naunyn). Recent studies have shown that the concentration of cholesterin in the blood is increased by certain pathologic conditions, among which are severe types of diabetes, obstructive jaundice, during the later months of pregnancy, during convalescence from typhoid fever, and in some patients with arteriosclerosis and nephritis. According to McNee, hypercholesterinemia may lead to an increase in the amount of cholesterin in the bile. The view that such a "cholesterin diathesis" may play a part in the pathogenesis of cholelithiasis is suggested by the frequent association of some of the above conditions (pregnancy, typhoid fever) with gall-stones, as well as by the recent observations of Chauffard's school and of Henes who found that in certain patients with cholelithiasis the amount of cholesterin in the blood is increased. The low incidence of cholesterin stones among the Japanese may also be due to the small amount of cholesterin in the diet of this people.

After feeding with cholesterin, or with cholesterin-containing foods, such as egg-yolk, the percentage in the blood is increased

from the normal average of .15 to .18 per cent. A physiologic hypercholesterinemia also occurs during the later months of pregnancy. The clinical importance, of course, of these facts is that cholesterin stones may be produced by precipitation from bile containing excessive amounts of this substance.

III. ASSOCIATED PROBLEMS OF GALL-BLADDER DIET CONTROL

The complication of obesity, so frequently seen with chronic gall-bladder disease, in itself speaks for limited food, but would not contraindicate the giving of a tablespoonful of olive oil, with two meals per day, widely separated, such as breakfast and dinner. Of course the indication for the limiting of carbohydrates is present as in any type of obesity. The treatment of any additional underlying factor, such as thyroid and gonad deficiency, when present should, of course, be carried out. The functional gastric disturbances, so frequently seen with gall-bladder disease, are usually of a reflex nature, and should be met by the special dietary limitation and other symptomatic measures.

Water drinking is also an important factor in the treatment of chronic bile-tract stasis, and we have found it a good plan to advise the ingestion of a glass of hot water, preferably before each meal.

SUMMARY AND CONCLUSIONS

1. That the giving of concentrated bile salts in chronic cholecystitis, in the hope of stimulating the bile flow through the gall-bladder, is illogical, although it does stimulate the flow of bile through the bile-ducts.

2. That the emptying of the gall-bladder is produced by an active contraction of that organ rather than by a flow of bile from the liver. Therefore the attempt to drain the gall-bladder by the Meltzer-Lyon method is useless.

3. That the maximum contraction response seems to occur when the bile-tract is in maximum tone, as in a state of relative hunger.

4. That of the various foods, fat causes maximum contraction and hence most efficient emptying of the organ.

5. That complete emptying of the organ is the best method of preventing stasis.

6. That the factors most contributory to gall-stone formation are gall-bladder stasis and disturbance in cholesterol metabolism.

7. That there is in certain chronic gall-bladder disturbances a tendency to hypercholesterin, which can be minimized by a diet low in cholesterol.

8. That olive oil is the fat least productive of cholesterol, and yet an efficient gall-bladder stimulant.

The rational dietetic régime in chronic gall-bladder disease therefore would consist of:

(a) Infrequent meals (two per day) of low cholesterol content, containing a limited quantity of olive oil (1 tablespoonful).

(b) The drinking of hot water before meals.

(c) Limited caloric intake in cases complicated by obesity.

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CLINIC OF DR. A. R. SHREFFLER

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DIAPHRAGMATIC HERNIA

WHILE hernia of the diaphragm is probably no more frequent today than in the time of the early investigators, the number of reported cases is rapidly increasing. This is due, in no small measure, to the aid we have received from the radiologists. Hippocrates noted that large openings in the diaphragm never healed, and in 1579 Paré described the postmortem findings in a patient who had suffered a penetrating chest wound followed by a hernia of the colon into the chest. Richards¹ has tabulated 137 cases of non-traumatic hernia which were reported in the medical literature from 1090 to 1923, only 47 of which were diagnosed during life. In 18,000 patients examined at the Mayo Clinic, Carman² reported 20 cases of hernia up to July, 1924. Failure to recognize hernia of the diaphragm is due to the relative infrequency of the condition, to the variety of outstanding symptoms, and to the absence of constant physical findings. This is especially true in the congenital type.

Richards' classification of hernias of the diaphragm is based on an embryologic study of the structure involved, and has done much to clear up the confusion incident to terminology. His classification is as follows:

1. True hernias (those with hernial sac):
 - (a) Congenital (present at birth).
 - (b) Acquired. Through the natural openings (mostly esophageal).
 - (c) Elsewhere (traumatic or non-traumatic).
2. False hernias (those without sac):
 - (a) Congenital.
 - (b) Acquired (all traumatic).

3. Eventration of the diaphragm (not a true hernia).

The development of the diaphragm is an important factor in determining the nature of the congenital hernias. Communication between the pleural and the peritoneal cavities terminates after the second month of intra-uterine life with the union of the anterior and posterior portions of the diaphragm in the median line. Failure of these portions to unite results in a hernia without a sac. Displacement of abdominal viscera into the chest cavity after this union takes place and prior to birth results in a true congenital hernia. Lewald³ describes a condition which he terms "thoracic stomach," in which the stomach develops above the diaphragm, and the esophagus is never found below. The early development of the liver and right diaphragm seems to protect the right side of the chest from hernia formation; the esophageal and vena cava openings on the left may account for the marked preponderance of hernias on that side. Due to its strong tendinous ring, the aortic opening is seldom, if ever, the site of herniation. Pancoast and Boles⁴ state that a true hernia through the aortic opening or the quadrilateral foramen has never been seen. In adult life the liver seems to act as a buffer against any traumatic action on the right side. Congenital hernias through the natural openings rarely occur, and when present are usually found in the esophageal opening. False hernias of the acquired type are invariably traumatic in etiology, and are accompanied by a rupture of the overlying structures. In the absence of a puncture or a stab wound, the hernia occurs at one of the weak points in the diaphragm.

The contents of the sac vary with the location and size of the structural defect. The entire stomach may be found in the chest cavity, or only a portion of it may be displaced. The transverse colon may be in the sac, and if the opening be large loops of small intestine are above the diaphragm.

Symptoms.—The symptoms of diaphragmatic hernia are often misleading, while in the congenital type the entire absence of symptoms may cause the condition to be overlooked, until some other physical defects prompts the patient to seek medical assistance. Not a few cases are recorded in literature in which

an individual reached adult life with a well-developed hernia without being aware of the defect. Frequently hernias appear after very slight trauma, and I am of the opinion that in these cases a slight hernia, insufficient to cause distress, may have been present for many years prior to the onset of symptoms. The case presented is apparently of this type, and is of interest because of the mild trauma preceding the dyspnea. Symptoms, when present, depend primarily on the type of hernia, the location, and the contents and size of the hernial sac. Dyspnea is often present, due to compression of the lung on the affected side with displacement of the trachea and mediastinum to the unaffected side. Cardiac embarrassment as a result of pressure may add to the respiratory distress. The dyspnea may be increased by change in posture, the ingestion of food and mild constipation. The taking of a heavy meal may give temporary relief to those patients in which the stomach is in the thorax, since the weight of the food is sufficient to pull the stomach down into the abdomen provided a semi-reclining or erect position is maintained. As a result of the respiratory and cardiac distress, cyanosis is usually present. Pain and vomiting occur in those cases having periodic or partial obstruction.

Physical Findings.—The physical findings are as varied as the symptoms, and are dependent on the structures involved in the sac, the amount of encroachment on the chest cavity, and the interference with the normal function of the abdominal viscera displaced. The majority of the hernias occur on the left side, and if the sac is large, the cardiac impulse will be displaced to the right. The right border of cardiac dullness may extend well to the right of its normal position, and the left chest may appear tympanitic throughout. The absence of breath sounds over this tympanitic left chest is the cause of much confusion between hernia and pneumothorax. Over the affected side may often be heard a peculiar musical, tinkling sound, similar to the sound of dripping water.

Radiographic Findings.—Since hernia is usually unsuspected in these patients prior to the *x*-ray examination, a radiogram of the chest is made in those in which the respiratory symp-

toms are most pronounced, in an effort to throw additional light on the confusing picture. In the cases having frank gastrointestinal complaints the radiographic examination may begin with an opaque meal. Fluoroscopic and radiographic examination of the chest will reveal air-containing structures in the thorax with or without the presence of lung markings. Peculiar crescentic markings will be noted where loops of bowel are protruding into the chest, and the haustral markings of the colon are often seen. The normal air bubble of the stomach is absent or displaced when that organ is caught in the sac. The heart and trachea will be found displaced to the right and the left diaphragm exhibits little or no excursion during respiration. The barium-meal will show shadows varying with the structures involved, and serves as a means of identifying them.

Prognosis and Treatment.—Although this condition is not incompatible with life, a guarded prognosis is always indicated. If there are signs of marked cardiac or respiratory distress, or if obstructive symptoms appear, surgical interference is imperative. The abdominal route still remains the more popular, but if the contents of the sac cannot be retracted into the abdomen, it may be necessary to open the chest before adhesions can be freed. The diaphragmatic defect is usually more easily repaired from above.

Differential Diagnosis.—The close similarity between the physical findings of diaphragmatic hernia and pneumothorax has been mentioned. We must rely on the radiogram to differentiate the two conditions. Eventration of the diaphragm so closely resembles hernia in symptoms, physical findings, and x -ray plates that only the dome-shaped shadow of the left diaphragm with evidence of abdominal viscera above definitely rules out the former. Pleuritic effusion, hemothorax, and empyema may be recognized by the presence of dullness, the absence of breath sounds, leukocytosis, and the general clinical course.

Case Report.—Mrs. G., age seventy-five, entered the hospital August 13, 1926, with the history of a slight fall while entering her automobile on the preceding day. The fall resulted in a

fracture of the neck of the right femur and a contusion of the right forearm. Her chief complaints on admission were pain in the right hip and forearm, slight dyspnea, and some nausea and vomiting which had been attributed to narcotics administered prior to admission.

Past History.—She stated that with the exception of three normal confinements she had not spent a day in bed since childhood.

Family History.—The father died at ninety-seven, and the mother at seventy-eight, of old age. Four sisters are living and well. None is dead. The patient was quite proud of the family record for longevity.

Physical Examination.—Nothing unusual was noted in the head and neck with the exception of those findings incident to her age. The chest findings were interesting and most unusual. The apex impulse could not be located and the right border of cardiac dulness was definitely displaced to the right. The heart was rapid, irregular at times both in force and rhythm, and was free from murmurs. Fairly normal lung findings were elicited over the right chest. Respiratory movements were diminished over the left side, and the percussion note was hyperresonant and low-pitched. There was a complete absence of breath sounds over the left chest, and at times a strange gurgling sound could be heard over the tympanic area. There was moderate tenderness to deep pressure over the epigastrium, but the examination of the abdomen was otherwise unimportant. The right femur was fractured through the neck, and later was found to be impacted and in good position. At the first examination I suspected we were dealing with a pneumothorax, although it was difficult to link this diagnosis with the history. While under observation the blood-pressure ranged around 120 systolic and 85 diastolic. Urinalysis: Specific gravity 1020; reaction, acid; faint trace of albumin; no sugar. Microscopic: occasional hyaline casts. Non-protein nitrogen 28 mg. in 100 c.c. blood. Blood Wassermann negative.

Because of the complicated fracture the radiologist resorted to the use of a bedside unit, and the first plate (Fig. 68) showed

intestine in the left chest with displacement of the heart to the right and compression of both lungs. The trachea was curved to the right. The transverse colon was identified as the sole contents of the sac by means of a barium enema (Fig. 69). Apparently the upward progress of the colon was retarded by an adhesion between the visceral and parietal layer of pleura. A



Fig. 68.—Bedside unit exposure showing bowel in left chest with displacement of heart and mediastinum to right.

distinct indentation of the colon could be seen where the diaphragmatic defect encroached on it.

Progress.—The first four days of hospital treatment were rather stormy. Attacks of dyspnea occurred, during which the respirations often reached 50 with the pulse-rate of 150 and pronounced cyanosis. We soon found these attacks were promptly relieved by enemata, and elevation of the head. After consultation with the surgical department, we decided to follow a

conservative course, if possible. There followed a period of three weeks during which the patient was free from distress on a liquid diet. There was no air-hunger, although the respirations ranged between 30 and 40 with a pulse-rate of 110. On the twenty-fifth day of hospital care the pulse suddenly became rapid, weak, and irregular, and after a marked rise in temperature the patient expired. Efforts to secure a partial autopsy



Fig. 69.—Bedside unit exposure after barium enema showing colon in left chest.

were unsuccessful. Death was evidently due to cardiac weakness since evidence of beginning hypostasis was noted on the preceding day.

Conclusions.—Small hernias of the diaphragm are present for years without causing symptoms. Large hernias occasionally follow mild trauma insufficient to account for the amount of diaphragmatic injury. It is reasonable to suppose that these

conditions occur as the result of slight injury or sudden muscular contraction on a small diaphragmatic defect already present.

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THE MANAGEMENT OF GOITER PATIENTS WITH CONGESTIVE HEART-FAILURE

THE treatment of congestive heart-failure, as encountered in goiter patients, is often more gratifying in its end-results than in any other type of cardiac disease. One is always conscious of the fact, while managing decompensation of the heart as found in other conditions, as chronic cardiac valvular disease, coronary artery disease, chronic myocarditis, etc., that although the symptoms may be alleviated for the time being by improvement in the functional activity of the heart, the underlying pathology will persist, and can rarely be affected by therapeutic measures. In goiter patients, however, although there may be cardiac decompensation of an extreme degree, there is always the hopeful outlook that if the function of the heart can be sufficiently improved by the ordinary methods of treating heart disease, the patient may be offered the opportunity of having the goiter removed.

If thyroidectomy is successfully accomplished, the patient is no longer subject to the toxic effect of the goiter upon the heart-muscle, and there is no longer the demand upon the heart for maintaining an increased blood-flow necessitated by an elevated metabolism. The benefit is thus twofold: The injurious toxin which apparently acts directly on the heart-muscle is eliminated, and the amount of work required of the heart is decreased. The end-result is often brilliant. Individuals completely incapacitated, and apparently on the verge of death, may be restored to useful activity without the same degree of limitation of exer-

cise, and without the prospect of almost certain recurrence of cardiac symptoms that faces the patient with other types of chronic heart disease.

The road to recovery for these goiter patients with congestive heart-failure is usually long and hard. Much depends on the intelligent co-operation of internist, surgeon, nurse, and patient, and every therapeutic resource may have to be utilized.

We are not speaking now of the typical goiter patient, who presents, with the other cardinal symptoms, tachycardia, palpitation of the heart, and dyspnea on exertion. The group under discussion includes only those with long-standing and neglected goiters, usually toxic adenoma, which after a prolonged period of varying degrees of toxicity pass on from the stage of such symptoms as palpitation and dyspnea to the stage of congestive heart-failure, with orthopnea, extensive edema of the subcutaneous tissues, ascites, pleural effusion, enlarged liver, and often pulmonary edema and infarction, or any combination of these symptoms. The heart in these patients may be tremendously enlarged, is usually irregular in rhythm because of auricular fibrillation, and often feeble in action in contrast to the forceful contraction of the heart in the less advanced goiter cases. The heart-rate is almost always rapid, especially so when there is auricular fibrillation.

The exact pathologic process in the heart-muscle is not clear. At autopsy one may find a dilated and hypertrophied heart, with little or no evidence of myocardial degeneration. Many show mild myocardial scarring, round-cell infiltration, or fatty degeneration, but not of sufficient degree to account for the great disturbance in the function of the heart. In some instances acute myocardial necrosis has been encountered, but this is unusual, and causes death by acute heart disease. The group of cases under discussion do not have acute heart disease.

For practical purposes the only satisfactory explanation of the cardiac failure in goiter is that the heart muscle becomes exhausted. The first response of the heart to thyroid intoxication is hypertrophy. The increased metabolic rate necessitates an increased blood flow, and to accomplish this the heart must

beat more rapidly and more forcefully. As in the case of any other muscular tissue, the increased work of the heart muscle is accompanied by hypertrophy. There is, in addition, apparently a direct toxic action of the heart, because the increased rate and force of the contraction is greater than would be expected if the increased metabolism were the only factor involved. After hypertrophy dilatation of the heart occurs, and there is a particular liability for auricular fibrillation to develop.

Auricular fibrillation may start during an acute thyrotoxicosis, and is very often transient and recurring before finally becoming permanent, or it may develop after long standing thyrotoxicosis of a lower grade, without the occurrence of any particular thyroid crisis. Sometimes it begins while the heart-muscle is still quite strong, and able to do its work satisfactorily. In this case there will still be relatively good cardiac compensation in spite of the irregular and very rapid heart-action. Eventually, however, the heart becomes exhausted, and in this state, whether there is auricular fibrillation present or not, cardiac decompensation occurs, with the symptoms of congestive heart-failure of various degrees. It is at this stage that we find the group of patients under discussion. Their outlook without proper treatment is practically hopeless. Even with the most careful treatment death may supervene. It may not be possible to improve the cardiac condition sufficiently to permit operation, but in many instances the final result is excellent, the patient returning to his daily life, often after a prolonged and stormy course, with good cardiac function.

Medical Treatment.—Needless to say the patient should be at absolute rest, preferably in a hospital where accurate observations can be made. The diet should be nutritious, and if it is possible for the patient to take it, a high caloric diet low in protein should be given. If the patient is toxic, it will be advisable to give fluids freely in spite of the presence of edema. If the edema is extensive and thyroid intoxication at the time is not great, fluids may be temporarily restricted. Occasionally the Karrell diet has been used, adding food rapidly and fluids gradually.

Sedatives are essential, morphin should not be withheld if needed. Luminal, administered until a highly nervous patient becomes somewhat drowsy, is very useful.

Digitalis is invaluable. Almost invariably the patient will have been taking some preparation of it before admission to the hospital, but in insufficient amounts, so that with auricular fibrillation the heart-rate will be rapid, from 120 to 150. In this case, there should be no hesitancy in giving immediately 5 c.c. of tincture of digitalis by mouth. If the patient is vomiting, it may be given per rectum, or one of the water soluble preparations may be given intravenously, but this is very rarely necessary, and should be avoided if possible. After the initial dose 2 or 3 c.c. may be given every six hours until a total of 15 or 20 c.c. has been reached, the heart-rate being the guide in dosage. If the rate is still rapid, more digitalis should be administered in 1 or 2 c.c. doses every six hours. The secret of success is to continue giving large doses until the physiologic effect has been obtained, whether the amount needed to do this is 20 c.c. or 100 c.c.

After the patient has been digitalized, as much as 1 c.c. three times daily may be required to maintain the digitalization. I have seen one patient who took 8 c.c. daily for several weeks, this amount keeping the arrhythmic heart at a rate between 80 and 90 without any toxic digitalis effects. There is no other kind of cardiac patients that can absorb such tremendous doses of digitalis over long periods of time without the development of nausea, vomiting, and other toxic symptoms. A convenient, but decidedly loose and unscientific way of explaining this is by saying that the toxic thyroid patient "burns up" digitalis faster than other cardiac patients. These large doses are not always necessary by any means, and indeed, one occasionally sees old goiter patients with auricular fibrillation and cardiac decompensation, but no activity in the thyroid gland, who without any digitalis at all have slow ventricular rates. There is usually no hope for improvement in this rare type of patient. In them apparently the goiter has done its damage, and then spontaneously quieted down, leaving the heart irreparably damaged. The digitalis is robbed of one of its chief effects because the heart-

rate is already slow, and there may be such degeneration of the kidneys that diuretic drugs will have no effect in ridding the patient of edema.

Diuretic drugs are often required if digitalis is not followed by a sufficient diuresis. Theobromin sodium salicylate, and theophyllin have been found most useful and satisfactory. Here, too, the dosage should be large enough to produce results. After testing with smaller doses, 8 gm. of theobromin sodium salicylate may be given in 2 gm. doses every four hours, and the effect noted. If a diuresis results, it may be repeated two or three days later if necessary. If this drug is not successful, theocin should be tried in the same way, giving 1.5 gm. in 0.5 gm. doses every three hours, repeating it a few days later if there is still edema present. Calcium chlorid, 2 gm. four times daily, will sometimes be followed by a good diuresis.

At times it is advisable to remove fluid from the pleural or peritoneal cavity by paracentesis, and this should be done if the effusion is extensive, or is embarrassing the patient's respiration. Iodin in the form of Lugol's solution should be used, whether the patient is classed as exophthalmic goiter or toxic adenoma. The effect is often striking in either type. Sometimes, however, there is apparently little or no benefit from the drug. Ten or 15 drops three times daily is usually a sufficient dosage.

No operative procedure is permissible until cardiac compensation has been obtained. It may take four weeks to four months to prepare the patient. After the heart condition has improved, if the patient is markedly underweight, as is usually the case, more time should be allowed for a gain in weight. The right moment for the operation should be carefully chosen, and all factors must be considered; namely, heart, nutrition, composure, and general appearance of the patient, tremor, sweating, etc. The basal metabolism is a very useful index, but by no means the most important one.

Quinidin sulphate has not been used in this group of patients. The reason for withholding it is twofold. First, because the auricular fibrillation is usually of long standing, and there is always the possibility that mural thrombi may have formed in the

auricles and that re-establishment of the normal auricular contraction will be followed by dislodgment of all or parts of the thrombi. I had the misfortune to observe embolic death from this cause in three instances during the early days of quinidin therapy, in patients with chronic cardiac valvular disease. Possibly, goiter patients are not so likely to have mural thrombi. The second and best reason for withholding quinidin is that digitalis gives better results. If enough digitalis is used the ventricular rate can almost always be controlled, and the dose can be accurately adjusted when the heart-rate is taken as the guide. If the cardiac mechanism is normal, and the rhythm regular, digitalis loses its chief action, because then the heart-rate is not appreciably affected in goiter patients. We may assume that the heart is already being "stimulated" by the hyperthyroidism, and in this case any "stimulating" effect from digitalis would only be adding insult to injury. Furthermore, since the ordinary rules as to digitalis dosage do not seem to be applicable to goiter patients, it is impossible to say when a patient has been fully digitalized if the rhythm is normal. It is for these reasons that I have not been using digitalis in any type of goiter patient except those with congestive heart-failure, in whom it is of great value, whereas in others I have never seen it do any good, and have often suspected that it was actually harmful.

Quinidin has been very useful in goiter patients with auricular fibrillation of short duration in whom there is no congestive heart-failure, and especially useful in the frequent instances of postoperative auricular fibrillation. There is a strong tendency for the normal mechanism to be resumed spontaneously, so that it is impossible to evaluate quinidin statistically in these cases. However, it is of undoubted value, and should be used particularly in the postoperative patients in whom the rapid and irregular heart-action persists for more than a few hours, and is accompanied by evidence of circulatory insufficiency. Three grains given once every hour for five or six doses is almost always enough. It should be discontinued whenever the rhythm becomes regular or after the sixth dose. It is rarely necessary to give a second course in postoperative cases.

During the period of preoperative preparation of the patient quinidin is valuable if there are recurring attacks of paroxysmal auricular fibrillation. The paroxysms usually will not recur if 3 grains are administered to the patient two or three times daily until the thyroid activity has quieted down.

Surgical Treatment.—All of the patients discussed in this paper were operated upon by Dr. Willard Bartlett, and the success in their treatment has been due to his delicate skill. Usually the operation has been done in the patient's room, to avoid the excitement and moving about attendant to sending the patient to and from the operating room. In most cases the patient is not informed as to the day of operation, and is given enough sedative the night before and morphin in the morning to allow anesthesia to be started with very little apprehension. It has often been found advisable, in this type of patient, to remove only one lobe at a time, selecting the largest side and approaching it through a linear incision parallel to the sternocleidomastoid muscle. This gives excellent exposure and allows rapid removal of the lobe. One to three weeks later the other side may be removed in the same way, the isthmus being taken at either the first or second operation, as convenient.

Fluids and carbohydrate food are forced before operation, and immediately afterward. At times the nasal tube has been inserted during the first postoperative days, if the patient is vomiting or otherwise unable to take fluids well, and large quantities of water, orange juice, and sugar administered through the tube.

Abstracts of the histories of 5 patients with goiter, and congestive heart-failure are given below. All of them are alive and leading useful, active lives at the present time. Some of them had been given up as hopeless and incurable, and the family informed that nothing more could be done.

Too often it has been assumed that the goiter is "burned out," and that even if thyroidectomy were possible no benefits would result. Most surgeons have an awful fear concerning operations on patients with heart disease. Possibly this is because they are too willing to believe that many of their operative deaths are

due to cardiac failure (especially "acute dilatation"), and do not like to consider hemorrhage, shock, or infection as more likely causes. Operative deaths in goiter patients are almost invariably caused by acute thyrotoxicosis. It is useful to remember that, unless there is actual cardiac decompensation at the time of the operation (in which case operation should not be attempted), it will be pretty hard to make the heart stop beating if the other factors in the case are satisfactory.

ABSTRACTS OF CASE HISTORIES

Case No. 6131.—Mrs. G. M. Age thirty-nine.

A goiter had been present for many years, but there were no other obvious symptoms until about a year before admission to the hospital, when the patient began to lose weight and complained of palpitation of the heart, dyspnea, and nervousness. Five months before admission a ligation of both superior thyroid arteries had been done, followed by transient irregularity and unusual rapidity of the heart, and finally permanent arrhythmia and a marked increase in circulatory symptoms.

On admission to the hospital there was extreme cardiac decompensation, with pitting edema of the legs, thighs, back and abdominal wall, ascites, and fluid in both pleural spaces. The heart was greatly enlarged, irregular in action, rate 146. The goiter was large and nodular.

During the first five days in the hospital 34 c.c. of standardized tincture of digitalis were given, and the heart rate decreased from 146 to 84. She was then kept on 1 c.c. of tincture of digitalis three times daily.

For two days the Karell diet of milk alone was given, and then food and liquids added, the food being increased as rapidly as possible.

Several courses of diuretin and theophyllin were administered, and during this time the edema completely disappeared, including the effusions in the abdomen and chest, so that within three weeks there was good cardiac compensation, the patient was eating with a good appetite, and gaining weight.

Thirty-four days after admission the left lobe and isthmus of the thyroid were removed, followed by a mild thyroid reaction, the heart rate being 168 on the second postoperative day, but decreasing to 108 two days later and 68 the following week, when the right lobe was removed. There was another milder reaction, heart rate climbing to 140, but rapidly falling again. The pathologic report from Dr. George Ives' laboratory was that the left lobe was composed chiefly of adenomata, and that the right lobe was hyperplastic. On the eighth postoperative day it was found that the heart was beating normally. Electrocardiograms, which had previously shown auricular fibrillation, now showed normal cardiac mechanism.

One month after the second operation the patient was discharged, completely free of all cardiac symptoms, and taking no medication. Nothing more was heard from her until a year later when I met her on the street by accident. She was well nourished, appeared quite healthy, and stated that there had been no return of her previous symptoms.

Case No. 2124.—Mrs. A. M. Age forty-three.

This patient's goiter was first noticed four years before admission to the hospital, and from the onset had been accompanied by increasing nervousness, loss of weight, palpitation of the heart, and dyspnea. One month before admission the cardiac symptoms had rapidly become worse, and extensive edema had developed.

Examination revealed orthopnea, marked pitting edema of the feet and legs, and enlarged heart beating irregularly and at a rate of 120, in spite of the fact that she had been taking digitalis. She was coughing constantly, raising bloody sputum, and there were numerous râles, dulness to percussion, and somewhat blowing breath sounds at the base of the right lung. These signs and symptoms were taken to indicate pulmonary infarction.

Although she had been taking digitalis just before coming to the hospital, 30 c.c. of standardized tincture were administered during the first four days there, and the heart rate decreased from 120 to 90. The drug was then discontinued, but in a few

days the rate was back to 120. During the subsequent five days another 30 c.c. were given, making a total of 60 c.c., and the heart rate then ranged between 80 and 92.

During the first two weeks the edema completely disappeared, the coughing ceased, and the signs in the lung cleared up. The patient began eating very well, with a good appetite, and at the end of three weeks her general appearance was excellent.

The basal metabolism was $+48$. An electrocardiogram showed auricular fibrillation.

Twenty-four days after admission to the hospital Dr. Bartlett removed the left lobe and isthmus of the thyroid. The postoperative course was uneventful. She continued taking 1 c.c. of tincture of digitalis twice daily. On the tenth postoperative day the cardiac rhythm became normal, but auricular fibrillation returned twenty-four hours later.

Nineteen days after the first operation the right lobe of the thyroid was removed. Dr. Ives' laboratory reported that the thyroid gland consisted of a mixture of colloid goiter and exophthalmic goiter. One week later, after several short intervals of normal regular pulse, the auricular fibrillation permanently ceased.

Two weeks after the second operation the patient was discharged. At home she gained strength rapidly, and within a month began tending to her household duties. Six months later she was found on examination to be free of all cardiac symptoms, the heart to percussion was apparently of normal size, and the pulse was slow and regular.

Case No. 6183.—Mrs. F. L. Age sixty.

A goiter had been present for twenty years, but there had been no obvious symptoms from it until during the year previous to admission to the hospital, when the patient began to lose weight, and complain of dyspnea and palpitation of the heart. These symptoms rapidly increased during the four months preceding entrance to the hospital.

Examination revealed cardiac decompensation, as evidenced by orthopnea, edema of the legs, and an enlarged liver, palpable

6 cm. below the costal margin. The heart was enlarged, beating very rapidly and irregularly.

Within the first ten days in the hospital 42 c.c. of tincture of digitalis were given, and the heart rate dropped to 78. All the signs of cardiac decompensation disappeared. The basal metabolism was +58.

Thyroidectomy was done by Dr. Bartlett one month after admission to the hospital. The pathologic report was cystic adenoma. On the second postoperative day the heart was beating regularly. Electrocardiograms, which had previously shown auricular fibrillation, now showed normal cardiac mechanism. The postoperative course was uneventful, and four weeks later the patient left the hospital with perfect cardiac compensation and a pulse rate of 70 to 75.

At the present time, ten months after the operation, she does her housework and leads an active life, has no dyspnea on exertion, and has gained 40 pounds in weight.

Case No. 4606.—Mrs. F. L. Age forty-one.

The patient entered the hospital with typical symptoms of Graves's disease, and cardiac decomposition. The goiter had been present for many years, but no symptoms had been attributed to it until nine months previously, when nervousness, loss of weight, and dyspnea developed, increasing rapidly and soon accompanied by edema. Six weeks before admission a ligation of both superior thyroid arteries had been done, but this was only followed by a further increase in the symptoms.

On entering the hospital the patient was found emaciated, with moderate exophthalmos, a large nodular goiter, enlarged heart, absolutely irregular cardiac rhythm, and a ventricular rate of 140. There was orthopnea, extensive edema of the feet, legs, and lower part of the back, signs of effusion into both pleural spaces, and a moderate ascites.

Although the patient had been taking digitalis, she obviously needed more. Five c.c. of standardized tincture were given at once, and then 2 c.c. every six hours for the next eight days, making a total of 69 c.c. The heart rate decreased to 80, but

the edema did not entirely disappear. She was then kept on 1 c.c. of digitalis three times daily, and several courses of diuretin and theophyllin were given. These were accompanied by diuresis and complete disappearance of the edema and effusions of fluid.

The patient had been exceedingly toxic, and fluids were allowed freely. She was given 15 drops of Lugol's solution three times daily, and three weeks after admission had improved greatly. The heart rate under the influence of digitalis remained slow at a rate of about 70.

Under a high caloric diet she slowly gained weight, and was allowed two months in which to gain as much strength as possible.

Dr. Bartlett removed the right lobe of the thyroid two and a half months after the patient had been admitted to the hospital. There was a fairly sharp thyroid reaction, which passed off in a few days. Two weeks later the left lobe was removed. This was followed by a more moderate thyroid reaction. The pathologic report was "mixture of adenomata and hyperplasia."

The pulse continued to be irregular, but remained slow with 3 c.c. of digitalis tincture daily. Two weeks after the second operation she was discharged, still having auricular fibrillation, but free of all symptoms of cardiac decompensation. She was not seen again, but six months later reported that she was getting fat and feeling fine.

Case No. 1790.—Mrs. H. L. Age thirty-one.

Two years before this patient entered the hospital she began to lose weight, and developed dyspnea and palpitation of the heart. These symptoms increased and within one year she was bedridden with cardiac decompensation. At this time both superior thyroid arteries were ligated, but no improvement followed. x-Ray treatment and injection of boiling water were also unsuccessful. Six months before admission to the hospital fluid was removed from the abdomen by paracentesis.

When the patient was brought to the hospital she presented the picture of advanced cardiac failure. There was orthopnea, edema of the legs, ascites, and an enlarged liver. The heart was

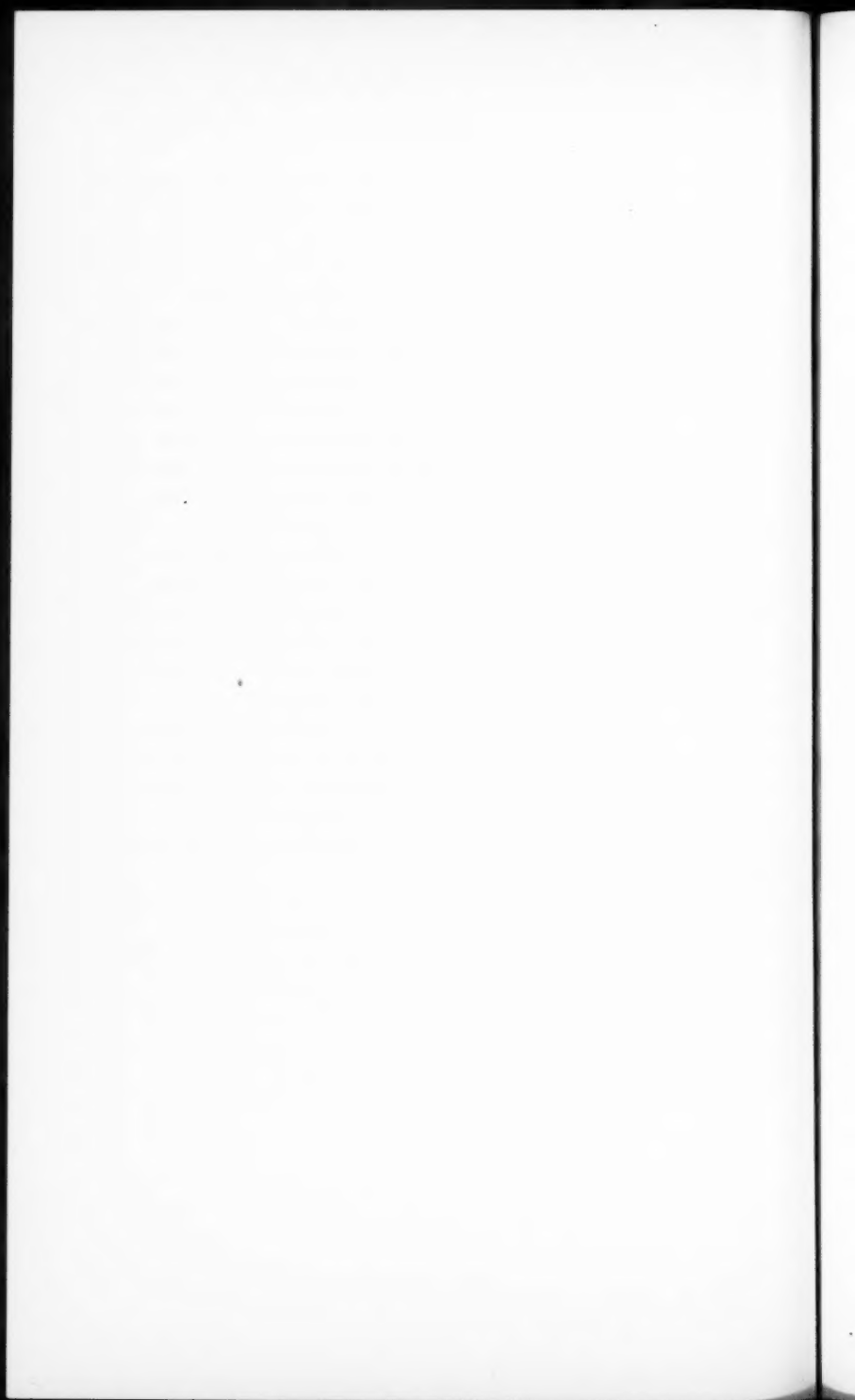
greatly enlarged, rapid, and irregular in rhythm. The eyes showed a moderate exophthalmos, and there was a good-sized nodular goiter.

During the first twenty days in the hospital 95 c.c. of tincture of digitalis were given, and the heart rate slowed down to between 72 and 76. At the same time a course of diuretin was given. The edema and ascites disappeared, but the liver remained somewhat enlarged. The basal metabolic rate was +43.

Three weeks after admission to the hospital Dr. Bartlett removed the right lobe of the thyroid gland, and four weeks later the left lobe. There was a moderate reaction after each operation. The pathologic report was "adenomata and diffuse colloid goiter."

The heart action remained irregular because of auricular fibrillation, but with 25 drops of tincture of digitalis three times daily it was kept at a slow rate.

At the present time, over two years after thyroidectomy, the patient is doing light housework, and leading a quiet domestic life, free from all cardiac symptoms except an irregular pulse. She continues to take the same amount of digitalis, and the heart rate varies between 65 and 80. The liver is no longer palpable, and there has been no return of dyspnea or edema at any time. The idea of using quinidin has been tempting, but rejected because the patient's lack of symptoms does not seem to justify the risk of embolism.



CLINIC OF DR. JOSEPH P. COSTELLO

ST. JOHN'S HOSPITAL

THYMIC ENLARGEMENT AS A CAUSE OF ATELECTASIS

Contention That the Thymus is a Direct Cause of Certain Types of Atelectasis in the Newborn. Its Symptomatology and Diagnosis. The Differential Diagnosis Between Atelectasis and Similar Conditions Found in the Newborn. The Importance of Radiology in the Diagnosis and Treatment of Thymic Atelectasis.

THE thymus, when enlarged at birth, can through pressure prevent the entrance of air into the pulmonary air vesicles, resulting in atelectasis pulmonum.

Atelectasis thus produced may be so slight as to be asymptomatic, or may be severe, resulting in death within a few hours or days.

This type of atelectasis differs from the types seen in a premature or poorly nourished weak infant in that such an infant is usually born at full term, and has a healthy appearance. The atelectasis is not at once apparent when respiration is established, but will develop after a few hours, thus resembling an intracranial hemorrhage. A predisposing factor is the family tendency toward an enlargement of the thymus. The type of labor or the kind of presentation is not a factor in the production of the disease. Short, obese mothers seem to be more prone to bear infants with enlarged thymi than the thin, delicate types.

The exciting factor is the enlargement of the thymus gland. It may not appear wide in x-ray pictures, and its thickness, which is most important, cannot be accurately measured by radiography.

The pathologic anatomy consists first in a marked enlargement of the thymus gland, in depth and usually in width as well. It is a simple hyperplasia of the medulla. When the atelectasis is extensive the lungs appear dark red or bluish-red, and feel firm. They do not crepitate as the normal lung does, and will sink when placed in water. The parts of a lung that are aerated will be emphysematous. In those cases that live for several days a hypostatic pneumonia will be found in the emphysematous tissue.

The symptomatology will be in direct proportion to the amount of lung tissue involved. *Rapid, shallow respiration* is the *predominating* symptom. At birth this is not pronounced, but becomes more noticeable at the end of two or three hours. In mild cases it will persist for weeks. It is this respiratory difficulty that is responsible for the infant's failure to nurse properly. The *cry* is of short duration and peculiar. In severe cases the cry would seem to indicate that the child is in great pain.

Cyanosis is not present at birth, but develops shortly afterward, and in cases that die the cyanosis will become progressively worse. It would seem that the cyanosis is a result not only of pulmonary, but of circulatory disturbance as well. Where the atelectasis is not extensive, cyanosis may be absent, or will be present only when the infant has a hard crying spell.

Digestive Disturbances.—These infants oftentimes have severe gastro-intestinal disturbances either in the form of vomiting, diarrhea, or obstinate constipation.

Elevation of temperature is due to dehydration or a beginning bronchopneumonia, and not to the atelectasis.

Nursing is interfered with early in the disease because of the embarrassment of respiration during the sucking reflex.

Physical Findings.—Cyanosis may or may not be present, as it will depend upon the amount of lung involvement. It is usually of a general type, and will improve somewhat upon changing the infant's position from prone to sitting up. The cyanosis gives the skin a peculiar mottled appearance.

The fontanels are normal or depressed, especially the latter in cases living several days, due mostly to dehydration.

The lips and fauces are normal except for cyanosis.

The Chest.—The thymus is enlarged and this enlargement may be more marked to the right or left. The heart may be displaced a little to either side, depending upon the amount of atelectasis on one side and emphysema on the other.

The lungs are hyperresonant, approaching flatness. Breath sounds are distant, of tubular quality. One cannot definitely locate the areas of consolidation, owing to the transmission of breath sounds in an infant's chest.

The abdomen is distended and in cases where chronic passive congestion has taken place there will be an enlargement of spleen and liver. Reflexes are normal.

Differential Diagnosis.—This condition must be differentiated from congenital heart lesions, syphilis, intracranial hemorrhage, and bronchopneumonia. It differs from congenital heart lesions in that we have less cyanosis at the onset in atelectasis. Congenital heart lesions will cause an enlarged heart together with systolic, diastolic, or presystolic murmurs. In heart lesions there is usually a marked chronic passive congestion of all viscera, with or without a polycythemia. Bronchopneumonia resembles atelectasis very closely, differing in that pneumonia is accompanied by fever and leukocytosis. x-Ray pictures are of importance in demonstrating the presence of an enlarged thymus.

Birth Injury.—The fontanelles will be tense, there will be cranial nerve paralysis, or convulsions. Respiratory center will be affected late if it is a hemispheric hemorrhage, late if it is infratentorial. The lungs are not affected unless there is an accompanying bronchopneumonia.

Syphilis.—A Wassermann test on the mother will determine whether or not the child has congenital syphilis. In addition to this test the presence of snuffles, rash, lymphatic hyperplasia, and enlargement of the liver may aid in the diagnosis.

Diagnosis.—The diagnosis is established by the rapid, shallow respiration, cyanosis, and interference with nursing, together with the physical findings of an enlarged thymus, areas of consolidation producing absence of breath sounds or distant tubular

breathing, no increase in the white blood-count, a negative Wassermann, and a radiograph showing either a wide or a dense thymic shadow.

Treatment.—When there is a family tendency toward an enlargement of the thymus, the expectant mother should be on a low caloric diet during the last two months of pregnancy, as it is

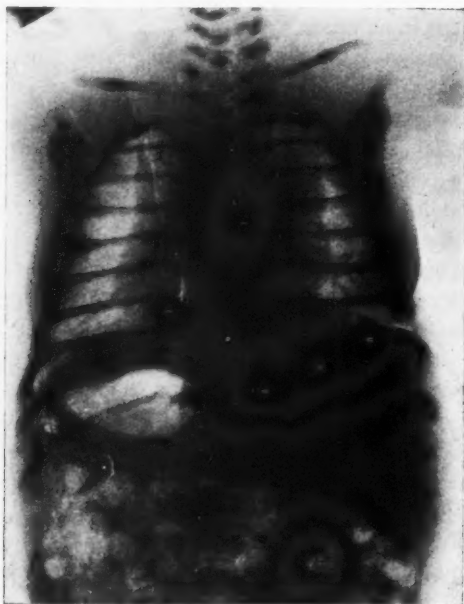


Fig. 70.—Case I. Dr. Smith's case. Showing marked enlargement of the thymus and poor aëration of the chest.

a well-known fact that the thymus gland is seldom enlarged when an infant is malnourished. This prophylactic measure might be of some value. *x*-Ray treatment should be given in small doses as soon as the diagnosis is established. The infant should receive plenty of fresh, warm air. Food should be given slowly, in a concentrated form. The infant should be watched

carefully to prevent dehydration. Crying is important, as it favors the expansion of the lung tissue.

Case I.—Baby O., delivered by Dr. W. A. Smith, 8/30/25, at St. Mary's Hospital. Child born at full term, normal delivery. Weight normal. Infant developed rapid respiration and cyanosis a few hours following delivery. When examined by me seven hours after delivery child was extremely cyanosed and respirations were very shallow. Fontanels were normal. No cranial nerve involvement. Eyes, ears, and throat normal. *Chest:* Heart sounds were distant and weak, no murmurs heard. *Thymus:* A wide thymic dulness could be easily demonstrated by percussion. *Lungs:* Percussion of both lungs gave a peculiar dull note. Breath sounds very distant and of tubular quality. Abdomen distended, liver and spleen palpable. Reflexes normal. Wassermann test on mother negative. Infant died ten hours after delivery. *Autopsy:* Normal except for chest. There was a marked enlargement of the thymus gland. Heart and blood-vessels normal. Lungs showed extensive atelectasis throughout.

Case II.—Case of Dr. W. C. Gayler's, delivered at St. John's Hospital in May, 1927. Full term baby, weighing $7\frac{1}{2}$ pounds. Resuscitation difficult. Infant became cyanosed with increase in respiration shortly after birth. Examination showed increase in respirations of a shallow type. Fontanels normal. No cranial nerve involvement. Eyes, ears, and throat normal. Neck normal. The thymic dulness was wide and the chest seemed dull throughout. Heart outline normal. Heart sounds weak. Breath sounds were distant, of tubular quality throughout chest. Abdomen distended, liver and spleen palpable. Reflexes normal. Infant died sixteen hours after birth. Autopsy showed a marked enlargement of the thymus. Heart normal. Lungs atelectatic throughout (see Figs. 71 and 72). The family history in this case confirmed the fact of the family tendency toward congenital enlargement of thymus. The mother gave birth to an infant two years ago which died of an enlarged thymus shortly after birth.



Fig. 71.—Case II. Dr. Gayler's case. Thymus, greatly reduced in size owing to fixing fluids.



Fig. 72.—Case II. Dr. Gayler's case. Lungs, greatly reduced in size owing to fixing fluids; marked resemblance between the consolidation of the atelectatic lung and diffuse pneumonia.

Case III.—Baby L., age five weeks, was brought to me because infant slept all the time, and seemed to have difficulty in taking its bottle. Its birth weight was 8 pounds, and its present weight $9\frac{1}{4}$ pounds. The labor was a difficult one. Upon examination the infant was seen to have a marked increase in respiration, 70 to 80 per minute. There was no cyanosis. The fontanelles were normal, no cranial nerve involvement, eyes, ears, nose, throat, and neck normal.

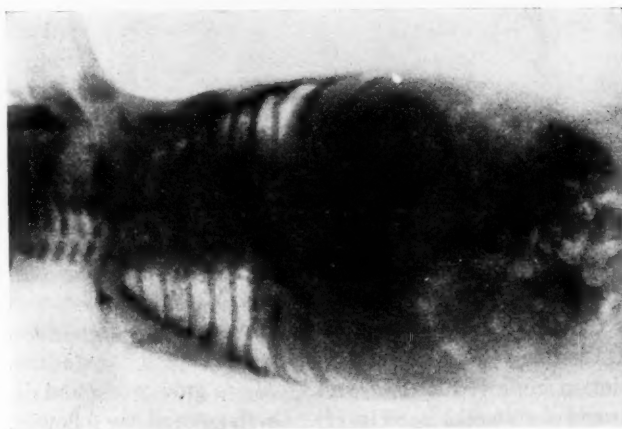


Fig. 73.—Case III. Showing the enlarged thymus, causing mild atelectasis.

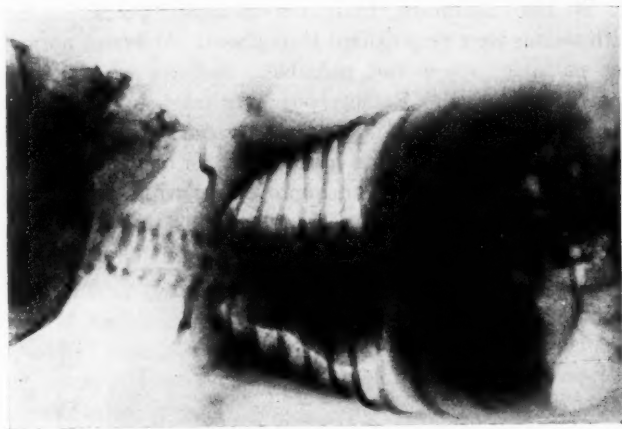


Fig. 74.—Case III. The same case after x-ray treatment.

Chest: There was a wide thymic dulness. Heart outline normal. No heart murmurs. Lungs were normal to percussion, but breath sounds were very distant throughout. Abdomen normal. Liver palpable, spleen not palpable. Reflexes were normal. Temperature normal. Radiographs were taken by Dr. Joseph Peden (see Figs. 73 and 74), and x-ray treatment begun. In addition to x-ray the infant was made to cry for one-half hour before being fed. There was an improvement within two weeks as the thymus decreased in size. I fully realize that many new-

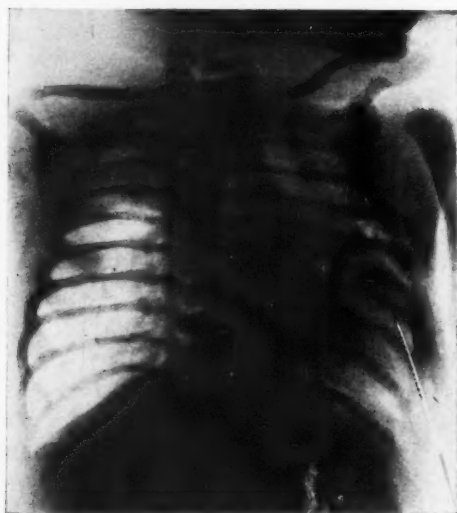


Fig. 75.—Case IV. Dr. Riordan's case. Emphysema of the right base, and atelectasis in the upper right and entire left chest.

born infants have atelectasis which improves, but I also know of cases that have become progressively worse, as in a case of Dr. L. M. Riordan's (Case IV), born at Missouri Baptist Sanatorium. The infant improved for two weeks, only to grow worse and die at the end of six weeks (see Fig. 75). On the second day following birth the infant seemed to improve and continued to do so for several days. Then the atelectatic areas seemed to become worse, ending in death at six weeks.

CLINIC OF DR. CHARLES HUGH NEILSON

ST. LOUIS UNIVERSITY

THE NERVOUS BREAKDOWN

I WISH to discuss with you today a subject which is an important one in the practice of medicine from every angle. It is a subject which applies more directly to the neuropsychiatrist, the internist, and the general practitioner of medicine. Every physician, however, is apt to come in contact with the so-called nervous patient. This question of the emotional, psychic, and mental condition of sick people is an important one to the physician, as these nervous patients are usually the most difficult to diagnose, and the proper therapy is most uncertain and difficult to carry out. We will, therefore, group all sorts of nervous conditions under the term "nervous breakdown," which is the subject of this morning's clinic.

The term "nervous breakdown" is a familiar word to the physician who has been in medical practice for any length of time. It is also a term which is well known to the laity. When you take the history of a patient, they will often inform you they are having or have had a nervous breakdown. They seem to have a rather clear picture of a group of symptoms which they call the nervous breakdown. It is not infrequent, in history-taking, that some physician has diagnosed their sickness as nervous breakdown.

What does this term mean? I must confess to you I do not know. Perhaps this morning's discussion will give us a better idea of what it means. In the first place, it is a term which is a catch-all for a group of symptoms which belong to the nervous system. Loose thinking and inaccurate diagnosis is responsible for the term. It is similar to the term neurosis, which is so frequently

heard and so frequently diagnosed. Neurasthenia, auto-intoxication, and catarrh of the stomach are similar terms which are so often used by the careless and loose-thinking physician.

The term "nervous breakdown" is more the result of inaccuracy in thinking than it is the result of careful, scientific work. If you ask a patient just what he means by this term, you will obtain such a variety of answers that it is confusing and even amusing. The underlying thought, however, is nervousness or nerve exhaustion. It is a well-known physiologic fact that nerves are not easily fatigued. Their physiologic property of conduction is not easily lost when proper physiologic conditions are given them. On this basis, we would, therefore, say that nervousness or nerve exhaustion cannot reasonably be a clinical entity. The nerves are only a part of our nervous system. We have the nerve-cells which play an important part in the physiologic function of the nervous system. The nerve-cells can be fatigued, but not easily. The nerve-cell plays an important part in receiving nerve impulses and relaying them, thus keeping intact the reflex arc. Fatigued nerve centers can occur, but the evidence for the fact is more experimental and physiologic than clinical. The nervous elements involved in the so-called nervous breakdowns, are, therefore, not directly connected with the nerves or nerve-cells. It would seem that the symptoms of this complex or syndrome are probably more dependent on the emotional or psychic make-up of the individual than anything else. We might, therefore, correctly call the nervous breakdown an emotional or psychic breakdown. It is, perhaps, just as difficult to describe an emotional or psychic breakdown as a nervous breakdown.

A normal individual is the harmonious relation between the reception of the constant nervous impulses of life, and their interpretation. The whole question is really one of interpretation. This, I believe, is the basic fact in the emotional and psychic upsets which are so frequently found accompanying many organic diseases. It is also the basic fact in the emotional and psychic disturbances which are functional in nature.

The so-called nervous breakdown in most cases is a functional disturbance of the nervous system, based on wrong interpreta-

tion of normal or abnormal sensations. The abnormal sensations are often based on physical disease, which is connected with the nervous system only as a result. The diseased body, with its effect on the nervous system, together with the wrong interpretation by the patient, brings on emotional upsets. These upsets result, in many of the cases, from self-analysis and mental uncertainty. In many instances, the knowledge that some diseased condition is present produces in many individuals a state of mental unrest, and a psychic upset then begins. Tranquillity of mind in the sick individual is the ultimate aim of the therapy of the physician.

The cerebrospinal nervous system, consisting of the brain, spinal cord, and spinal nerves are frequently involved in disease processes. The effect of the various diseases on this division of the nervous system do not result in a great number of psychic and emotional upsets. These emotional upsets do occur, as everyone knows. The disturbances in the cerebrospinal nervous system are usually organic. Emotional upsets may occur as in any other diseased condition, as a result of mental uncertainty. This emotional disturbance may, in a measure, hide or mask the nature of the disease.

When we study the sympathetic nervous system, we find many disturbances which may be classified under the general term of autonomic imbalance. The thoracico-lumbar division of this system acts physiologically as an antagonist to the cranio-bulbo-sacral division and vice versa. The cranio-bulbo-sacral division is generally called the parasympathetic, and the thoracico-lumbar division is called the sympathetic proper. In normal individuals, there is a balance between these two systems. Any overactivity of one division produces a rather characteristic physiologic effect. Clinically, the manifestations are also rather definite. The division which is usually found overactive, or, at least, produces more marked physiologic disturbances is the sympathetic proper. The results of this imbalance are frequently found. Often, there is a physical make-up which is an accompaniment of this imbalance. We find this more frequently in the asthenic type of individual than in the sthenic. Imbalance

may, however, be found in the sthenic individual as a result of diseased conditions. Among the diseased conditions which may produce an over-acting sympathetic nervous system proper is pulmonary tuberculosis, hyperthyroidism, focal infection, and the so-called neurocirculatory asthenia. The tachycardia, the frequency of muscular tremors, the labile circulatory apparatus, the fatigability, and the marked nervous symptoms as a direct result of the intoxication, or as an acquired condition, are common to all these conditions. The emotional and psychic upsets are frequent and pronounced. Many of these individuals have been labeled neurotics, neurasthenics, and have also been said to suffer from a nervous breakdown by their physicians, their friends, or by themselves.

From a study of the condition which is called nervous breakdown, we may state the following facts:

1. It is a term well known to the laity who often make the diagnosis.
2. Many physicians use the term and make such a diagnosis on improper evidence.
3. The psychic and emotional upsets which frequently occur in many diseases are often diagnosed as nervous breakdowns.
4. Such conditions as early pulmonary tuberculosis, toxic thyroids, many cases of focal infection, and so-called neurocirculatory asthenia with their accompanying psychic and emotional upsets are frequently diagnosed as neurasthenia and nervous breakdown.

Case I.—I will show you this morning some cases which I hope will bring out some of the facts which I have discussed with you this morning. This first patient is a man of forty years, who came to me in April, 1926. He had been sick for two and a half years. During this time he had consulted several physicians. One physician made a diagnosis of liver trouble. One made a diagnosis of asthenia of unknown origin. Still another, made a diagnosis of neurasthenia. A neurologist confirmed this diagnosis. Many of the patient's friends told him his trouble

was a nervous breakdown due to overwork. He came to me complaining of weakness, fatigability, inertia, and lack of initiative. He was sleepless, nervous, and irritable. At the time of my first examination, he seemed mentally alert, but his intimate business associates said they had noticed quite a loss of power in his business acumen. At the time of my examination in April, 1926, everything in the examination was negative, so far as physical findings were concerned, except for a systolic blood-pressure of 98. This low blood-pressure was continued throughout the disease. I made the diagnosis of hypotension with asthenia, cause unknown. I was not fully satisfied with my diagnosis and kept working him over. He finally stated, he thought the commencement of the trouble followed an attack of influenza three years before. With a little closer questioning, I obtained a history of diplopia. It then dawned on me that I might be dealing with lethargic encephalitis. At no time during two months of treatment was I able to obtain any definite physical findings. About June 1, 1926 I noticed a tremor of the tongue. There was also a slight exaggeration of the deep reflexes of the right leg. The other symptoms remained the same, except that he now had a definite lethargy, loss of ambition, and loss of interest in his business. During August and September of this year I did not see the patient, as he had concluded that physicians could do him no good. I saw him again in October, 1926, *i. e.*, about seven months after my first examination, and his condition was about as you see him today. As you look at this patient, you will see a man with a well-developed case of lethargic encephalitis, with a Parkinsonian syndrome. Notice the mask-like face, the slow muscular movements, the muscular tremors, the characteristic body posture, the drooling of the saliva, the slow, careful, hesitating speech, and the slow cerebration. He is unable, at this time, to carry on his business; and is unable to completely dress himself. It is now eleven months since the first tangible physical signs appeared. It is three and a half years since he became sick. During two and a half years of his sickness, he was called an asthenic, a neurasthenic, and was said to be suffering with a nervous breakdown. In fact, during all this time, his claims were

ignored and his statements as to his feeling ill were discounted. It is probable, however, that, had the diagnosis been made at an earlier date, nothing more could have been done. This is a somewhat extreme case, but it shows us how careful we must be before making the diagnosis of neurosis or nervous breakdown.

Case II.—This young man, whom I will show next, is thirty years old, and has been sick for eighteen months. He has been unable to follow his occupation which is that of a minister. The beginning of his trouble started with a bad cold which continued for a month or six weeks. He afterward went to work, but became so ill that he could not perform his ordinary duties. He consulted a physician and the physician said that he had caught cold and that he had bronchitis. When he went to work, he found that he was nervous, excitable, and had the feeling of some impending disaster. He had "blue" spells, which would continue for days at a time. He again consulted a physician who gave him a tonic, and told him he was nervous and was worrying too much about himself and his work. He advised him to eat well and forget it. He now noticed that he was losing some weight, and was becoming more and more nervous, irritable, and excitable. He always felt worse in the afternoon and began coughing in the evening. He went to another physician who told him he had bronchitis. This physician also told him he had a very rapid heart because of his nervous and excited condition. He said, "unless you are careful, you will have a nervous breakdown." This physician did not examine the patient very thoroughly, and told him that he was nervous and bordering on a nervous breakdown. He comes into the hospital a year and a half after the beginning of the symptoms, and his clinical course is as follows: During the afternoon and the evening, he has a temperature of 100° F., with the nervous symptoms all exaggerated. He has lost strength and weight. He notices now that he has shortness of breath on exercise. The skiagram of the chest shows a moderately advanced pulmonary tuberculosis. The sputum, however, is negative. This case is an example of carelessness on the part of the physician. They failed to take this boy's history seriously,

and did not examine him. Because his symptoms were mainly those of nervous excitement, with marked mental depression, together with indigestion, they concluded that it was simply a case of nerves. His friends also had told him that he was suffering from a nervous breakdown. Neglect on the part of the physician, the diagnosis of his friends, and the constancy of his symptoms produced in him more and more psychic upsets, so that the pictures seemed really to be one of nervousness. A good, careful examination, with an x-ray of the chest, and the clinical course of the patient from the beginning of the case up to the present time certainly is the picture of a beginning and advancing tuberculosis. Many examples, similar to this case, have been seen by every good physician. The good physician, however, would probably have made a diagnosis a year and a half ago. The outstanding feature in this particular case has been the nervous symptoms. It was these symptoms which prohibited this young man from carrying on his ordinary occupation. I would warn you, young gentlemen, that you may frequently find such patients in your practice. It is a pretty safe statement when we say that marked nervous symptoms, emotional and psychic upsets, begin rather suddenly in an otherwise healthy individual, one should always be on his guard and hunt for tuberculosis. It is to be hoped that you gentlemen will not make the mistake that has been made in this case.

Case III.—The next patient shows you the results of the removal of badly infected tonsils. This young man has now been working for one year at his occupation which is that of a butcher. His work is very heavy and, at times, he has to work at high speed. However, he is able to do as much as any man and has not been sick for the past year. If you were to examine him today, you would find him a normal individual in every respect. About one year ago, he came to me because of marked nervous symptoms, tremors of his hand, shortness of breath, beating of his heart and, in fact, he was unable to do his work because of these pronounced symptoms. In addition to these symptoms, he had a fear of heart

trouble. An uncle of his had died some months before of a de-compensated heart. At that time, the young man was having tachycardia and shortness of breath, and at once jumped to the conclusion that he was suffering from the same trouble as his uncle. He consulted several physicians and they told him he had a nervous heart, which might develop into trouble similar to that of his uncle's. These various opinions, coupled with his symptoms, produced in this young man an emotional and psychic upset so severe that he was unable to sleep, eat, or work. He was in this state for about one year preceding my examination. He came to me and I found him suffering from a marked tachycardia, shortness of breath, tremors of the hands, flushing of the face and neck, slight temperature, low blood-pressure, muscular weakness, and a marked nervous condition. I examined him closely for tuberculosis and found none. His basal metabolism was normal. In the course of the examination, I found his tonsils were very greatly enlarged and the crypts filled with cheesy material which, on microscopic examination, showed many pus-cells and a variety of bacteria. I advised the removal of these tonsils, which was done. For one month following the tonsillectomy I gave him small doses of digitalis and some bromids, and did not allow him to do any work. I gave him a high-caloried diet, and insisted on long hours of rest. The improvement in his symptoms was rapid and definite. In a month's time, he said he felt perfectly well. Examination at this time showed the heart rate to be practically normal. The flushing of the face had subsided, and the blood-pressure had risen 10 points. The tremors of the hands, however, still persisted. His nervous condition and emotional excitement was a thing of the past. In other words, the removal of these tonsils had removed a focal infection which had acted upon the sympathetic nervous system, producing a chain of symptoms not unlike that of hyperthyroidism, early tuberculosis, or neurocirculatory asthenia. The autonomic imbalance, together with his fears of heart disease, were sufficient to produce in this young man emotional and psychic disturbances which were so marked as to lead many friends and even physicians to diagnose his trouble as a nervous breakdown.

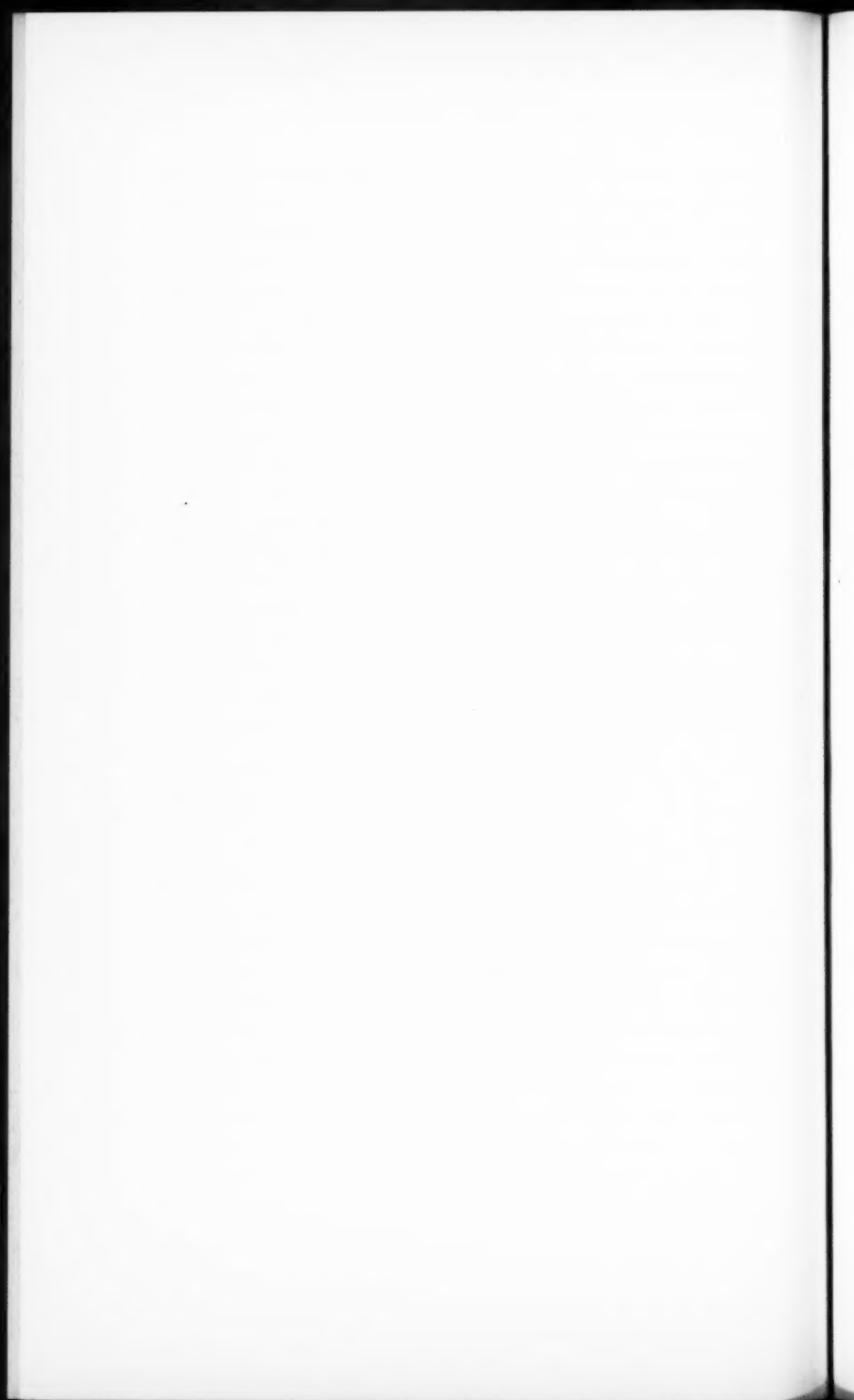
Case IV.—This next case which I will show is a young woman of thirty-three years, whose occupation is that of a stenographer. She had been sick about six months before coming to me for examination. During the early part of her sickness, she had tried to work, but was unable to do so continuously. She would work a week, and would have a nervous attack which resembled a hysterical attack. Often these nervous explosions would occur when she was at work in the office, particularly when she was crowded. She lost weight, became sleepless, dreaded to go to the office to work. She became very nervous and excitable so that she avoided crowds and every form of excitement. The diagnosis had been made of a nervous breakdown due to overwork and disturbance in her menstrual function, because of its irregularity. At my first examination, I found her pulse rate to be 120, with marked irregularity of the heart-beat. She had a marked tremor of the extended hand, marked flushing of the face, and showed marked nervous irritability and excitement during the examination. During this examination, I found a small thyroid, nodular in character, but distinctly palpable. The basal metabolism showed 30 per cent. plus. The diagnosis, in this case, is clear-cut. The rather sudden onset of her nervous symptoms, the inability to do her work because of nervous excitement, the loss of weight, the insomnia, the basal metabolism of 30 per cent., the marked vasomotor disturbances, and the presence of the nodular goiter made a diagnosis of hyperthyroidism. Any physician who examines such a case ought to make the diagnosis without any difficulty. She had consulted two physicians, both of whom called her trouble a nervous breakdown or neurasthenia. This is another example for you, young gentlemen, of how careful one should be in making a diagnosis of nervousness.

Case V.—This next patient whom I will show you is a young man, twenty-seven years old. His occupation is that of a decorator. He works in a store which sells fine furniture, and other artistic things for the home. He chose this occupation because of a natural liking for this kind of work. As you look at this young man, you will notice that he is

very slender. You will notice the fine texture of his hair, the thin, almost transparent skin, the long arms, and the long, tapering fingers. We might call this the musical or artistic hand. You will notice the narrow, subcostal angle. You will also notice that he has a rather prominent abdomen for so slightly built an individual. This is what we call a pot belly. In fact, as you study this young man, you see that he has rather a distinct physical type, a type which we call the asthenic type of build. In school he was very bright and excelled in his mental work, but had no inclination for or ability in athletics. He has always tired easily, has always been nervous, and always sensitive to his surroundings. The heat of summer exhausted him, as also the cold of winter. Noises, excitement, and disturbances in general are abhorrent to him. He never has been very vigorous in any line of work. When he was about twenty-two years old, he ran a slight temperature during the summer months. He became nervous, excitable, and irritable. During the winter months he was somewhat better. During the last five years he has frequently consulted physicians for his physical condition. He was told he was nervous, worked too hard, etc. He has been so incapacitated at times that he was unable to do his work on account of his weakness, nervousness, and excitability. He entered the hospital a few days ago complaining of a whole group of symptoms. He said he had shortness of breath, palpitation of the heart, muscular weakness, insomnia, indigestion and constipation, and was extremely nervous. Physical examination shows him to be in fair physical condition, but he has the following definite findings: His pulse rate is constantly around 100. He has marked tremors of the extended hand. His systolic blood-pressure is 95. He has marked flushing of the face and neck. *x*-Ray examination of the gastrointestinal tract shows a marked atony of the stomach and intestines. There is a general ptosis of all these organs. He has been running a temperature from 99.2° to 99.6° F. And at this time, as he says, he feels miserable. The basal metabolism is normal. *x*-Ray of the chest is normal, and the other physical findings are all negative. This history of rapid heart, nervousness, loss of weight, mobile vasomotor apparatus, the slight tempera-

ture, and the appearance of the patient would make one think of beginning tuberculosis, but there is no other evidence of this trouble. The basal metabolism rules out, in all probability, toxic thyroid. The thyroid is not palpable. There are no focal infections that can be discovered. The diagnosis must, therefore, be: Neurocirculatory asthenia. This condition is frequently found in many individuals, particularly young adults, and is often mistaken for tuberculosis, hyperthyroidism, or focal infection. During the war, in examining young men, many such cases were found. This has been called a war neurosis. Perhaps it is more common at such times, but it certainly is not uncommon in every-day practice. These patients are real entities. The cause of their trouble is undoubtedly an autonomic imbalance, with the sympathetic nervous system proper over-acting. Whether the basis of this trouble is due to the internal secretions, or due to some other cause is not clearly known. It is difficult to distinguish between the above-mentioned diseases and this trouble. These patients have repeatedly been diagnosed as incipient tuberculosis, hyperthyroidism, or focal infection. They have also been repeatedly diagnosed as neurotics, neurasthenics, and nervous individuals. Many of them have been said to suffer from nervous breakdown due to overwork, etc. Young gentlemen, as you become practitioners of medicine, you will frequently run across this type of case, and I feel that you will be on your guard and not make an incorrect diagnosis.

In this series of cases, I have tried to show you some of the interesting types that are met with in practice. These types are borderline cases, and unless one is careful, he will make an incorrect diagnosis. A discussion and demonstration of cases such as we have shown this morning, will be nothing new to the physician who is constantly on the alert, but to that physician who does not think clearly or examine carefully this clinic should be of value.



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THE DIAGNOSTIC VALUE OF BLOOD CALCIUM ESTIMATION

Introduction. Report on 290 Consecutive Cases with Reference to Technic. Accepted Normal Standard. Functions of Calcium in the Body. Regulation of the Blood Calcium. Calcium Content in Group Cases: (a) Tetany. (b) Diseases of the Respiratory Tract. (c) Hypersensitiveness. (d) Endocrine Disorders. (e) Arthritis. (f) Migraine and Epilepsy. (g) Cardio-vascular Disease. (h) Infections. (i) Rickets. (j) Malignancy. (k) Miscellaneous. Summary. Incidence of Positive Chvostek Sign as Compared with Calcium Content. Treatment in Calcium Deficiency. Conclusions.

INVESTIGATIONS in this subject have been prompted by the advocacy recently by various writers of calcium therapy in many of our common diseases and disorders, in which calcium deficiency is not demonstrable clinically. The question has arisen, however, as to whether there can be a blood calcium deficiency demonstrable sufficient to cause constitutional disturbances without being evidenced in a clinical way. Investigations were made in 290 consecutive cases,¹ no attempt being made to choose a selective group. Over 200 test determinations had been made previously to this series, for the purpose of perfecting the technic and for the verification of a standard normal. Caution might be observed, not to place too much faith in reports from laboratories where only an occasional calcium determination is made. Verification of a standard was undertaken, using the blood from individuals in whom no clinical evidence of calcium de-

¹ Observations conducted under the service of the Engelbach Clinic.

ficiency existed. The results from this latter work coincided with those of Halvorsen and others, who had held that the normal calcium content of the blood-serum is 9 to 11 mg. per 100 c.c. of blood.

The method employed in these determinations was that patterned after Kramer and Tisdall, as modified by Clark and Collip. This consists essentially in the precipitation of the calcium by an oxalate, followed by solution in sulphuric acid, and then titration against potassium permanganate. It is a comparatively simple method after the technic is once acquired, requiring but 2 c.c. of blood-serum, which can be collected in a common tube in which blood for a Wassermann test has been obtained.

Functions of Calcium in the Body.—For many years calcium has been considered a basic element of the body. From the viewpoint of biochemists, it has three important functions: (1) In the proper development of the skeletal and supporting structures of the body; (2) in the coagulation of the blood, and (3) in the maintenance of the so-called mineral balance. Clinical application has been made in various diseases and disorders, chief of which may be listed, in the order referable to calcium function given above: (1) Rickets, early decay of the teeth, ununited fracture, various bone deformities; (2) diseases associated with delay in clotting time, purpura, hemophilia, cases in which jaundice has been present for a prolonged period; (3) tetany, spasmophilia, and recently, diseases affecting almost all systems of the body.

The disease of rickets in its etiologic phase has long attracted the interest of pediatricists. Recently general medicine has heard much of mineral balance. A deficiency in calcium content, or improper calcium metabolism, is thought to create an imbalance in the mineral constituents of the body, resulting in a disturbance of nervous functioning, muscle contraction, and heart-beat. Thus these disturbances may cause an upset in any of the body tissues. The mineral balance, as shown by Cameron, is demonstrated in the following ratio:

$$\frac{\text{Concentration of sodium ions} + \text{potassium ions} + \text{hydroxyl ions}}{\text{Concentration of calcium ions} + \text{magnesium ions} + \text{hydrogen ions}}$$

An increase in any factor above the line, or a decrease in any factor below the line, will cause an increase in tissue excitability; and, *vice versa*, a decrease in any factor above the line, or an increase in any factor below the line, will cause a diminished excitability. The importance of calcium in the balance system of ions represented above and its essential rôle in the control of tissue irritability can thus be noted.

Regulation of the Blood Calcium.—As far as has been established, the parathyroid glands are the most influential agent in the control of the body calcium. That removal of the parathyroid glands will cause tetany, with a reduction in the blood calcium, is confirmed by most clinicians and experimental physiologists. At least some of the forms of tetany, if not all, have been proved to be due to parathyroid deficiency, and tetany in many, if not most cases, has been overcome by the administration of calcium salts. MacCallum and Voegtlin, whose contributions have aided in clearing up this much-discussed question, conclude the following about calcium salts and tetany: "These salts have a moderating influence upon the nerve-cells. The parathyroid secretion in some way controls the calcium exchange in the body. It may be that in the absence of the parathyroid secretion substances arise which can combine with calcium, abstract it from the tissues, and cause its excretion, and that the parathyroid secretion prevents the appearance of such bodies. The mechanism of the parathyroid action is not determined, but the result of the impoverishment of the tissues with respect to calcium and the consequent development of hyperexcitability of the nerve-cells is proved. Only the restoration of calcium to the tissues can prevent this." That restoration of the calcium will relieve this hyperexcitability has been demonstrated by Luckhart and Goldberg, who found that dogs could be kept alive in good condition after thyroparathyroidectomy by feeding them 1.5 gm. of calcium lactate per kilogram of body weight per day. Later Compere and Luckhart reported calcium carbonate, calcium nitrate, and calcium acetate as effective as calcium lactate in relieving tetany in animals. They found that calcium phosphate seemed more liable to induce tetany than to relieve it.

Attempting to disprove the specificity of calcium in this condition, Berkeley and Beebe tried strontium chlorid. They found it effective in the treatment of tetany, but that it acted later and with longer effect than calcium lactate. Dragstedt and Sudan found that tetany in dogs was relieved by strontium lactate in doses of 1 to 1.5 gm. per kilogram of body weight daily, but that it prolonged the adult dog's life only about twenty-four days, the animal failing to resume its normal state after the administration of this substance was discontinued. They likewise found that, by feeding dogs suffering from tetany 1.8 to 4.4 gm. of calcium lactate per kilogram of body weight per day, these could be kept in good condition, and after five to eleven weeks thrived without further substitution of calcium lactate.

Collip added the latest important chapter on this subject when, in 1925, he discovered a specific hormone of the parathyroid gland. He found that the intramuscular injection of this hormone caused a definite rise in the blood calcium. This effect of parathyroid hormone has been confirmed by other workers in this field, but whether it is a specific in tetany is still a mooted question. Cameron and Moorhouse have maintained that the parathyroids elaborate an internal secretion which controls the formation of non-diffusible calcium compound and that this, by a series of interlocking equilibria, keeps the diffusible calcium content of the blood at a constant ratio with itself.

Calcium Content in Group Cases.—Chiefly on the basis of calcium function, innumerable contributions, corroborative and contradictory, have appeared concerning calcium deficiency as an important factor in many of our well-known illnesses, such as tetany, spasmophilia, tuberculosis, asthma, chronic arthritis, serum sickness, hypersensitiveness, hay-fever, purpura, hemophilia, and epilepsy. Investigators have claimed such varying results that one is left in doubt as to their authenticity. Calcium substitution has been beneficial in various types of cases, but many claims have been made for it on grounds which do not appear well founded. In striving to treat the cause, it is essential to demonstrate such cause either clinically or by accepted lab-

oratory method. Following are given the results of investigations in cases grouped as nearly as possible according to system or etiology.

Tetany.—Probably in no other disease has treatment with calcium been more effective than in tetany. As not all cases of tetany can be relieved by calcium administration, a doubt remains as to whether this disease is purely a result of calcium deficiency. The syndrome of tetany appears to stand in definite relationship to disorder of the parathyroid glands. It has been demonstrated that removal of the parathyroid glands at operation is followed by the development of a severe, usually fatal form of tetany, tetania parathyreopriva. This has occurred experimentally in animals, and accidentally following strumectomy in the human. Though not accepted by all students in this subject, it is widely conceded that the syndrome of tetany in either adult or child is due to a disturbed parathyroid function. Definite proof that this is the only factor in all forms of tetany has not yet been established. Anderson and Graham have concluded that active tetany is always accompanied by calcium deficiency, and that latent tetany may or may not be associated with calcium deficiency.

In this series of 290 cases there were only 3 which were diagnosed as latent tetany (none of active tetany). The blood calcium content was found normal in all 3.

Diseases of the Respiratory Tract.—The calcium content in tuberculous cases has drawn the attention of all workers in this field. Halvorsen, Mohler, and Bergeim found the blood calcium in tuberculosis ranging from 8.4 to 11 mg. per 100 c.c. of blood. Teptitz confirmed these investigations. Greisheimer and Van Winkle concluded from their work on 55 patients, ranging in age from twenty-five to fifty-one, that tuberculosis is not characterized by demineralization, that there is no difference in the calcium content in the two sexes, and that there is a tendency to lowered calcium with increasing age. They regard this last theory as of possible significance in considering lowered calcium in certain illnesses. Howe and Medlar discovered no evidence of abnormal calcium content in tuberculosis, as, likewise,

Ferretti. Many other reports are made, revealing a wide divergence in opinion. Pottenger has concluded, on reviewing the work done, that there is no demineralization in tuberculosis, though Bergeim still maintains that it exists.¹

The calcification occurring in healed tuberculosis is commonly believed to be a secondary process due to local changes in the tissues, suggested by Cameron as "fatty degeneration." Pottenger has explained the rationale of calcium therapy in asthmatic paroxysms on the physiologic basis that it causes either a hyperexcitability of the vagus nerve, which increases the potassium of the cells, or a hyperexcitability of the sympathetic system, which increases the calcium, reporting good results in treating such cases. Brown and Hunter have reported calcium deficiency in asthma. Thommen found no favorable results in the treatment of asthmatic paroxysms with calcium.

The respiratory diseases encountered in this investigation numbered 23, of which 22 were tuberculosis and 1 asthma. Of the 22 cases of tuberculosis, 13 were latent and 9 active. Of the 13 cases of latent tuberculosis, 2 (15.4 per cent.) showed a calcium deficiency, 8.5 and 8.6 mg. respectively. Of the 9 active cases, 3 (33.3 per cent.) showed a calcium deficiency, 7.5, 8, and 8.5 mg. respectively. In both latent and active cases of tuberculosis, a calcium deficiency was present in a total of 5 (22.7 per cent.) out of 22 cases. The 1 case of asthma studied had a normal blood calcium. Thus, of the entire 23 cases of respiratory disease, 5 (21.7 per cent.) showed a calcium deficiency.

Hypersensitiveness.—Brown and Hunter, who, as mentioned, reported calcium deficiency in asthma, found it also in hay-fever and allied conditions, but no definite conclusion is drawn from their report, nor can confirmation be obtained from the literature.

This series comprises 7 cases of hypersensitiveness (protein sensitization, urticaria, etc.). Calcium deficiency was present in 1 (14.2 per cent.) of these 7 cases. The calcium determination in this instance was 8.5 mg.

The Endocrine System.—(1) *Parathyroid Glands.*—The para-

¹ Report of discussion before the Therapeutic Society, Washington, D. C., May 14, 1927.

thyroid glands are chief among the endocrine organs concerned with calcium metabolism. These have been considered previously in discussing the regulation of the blood calcium. Because of the intimate relation in function existing in the endocrine system, it is logical to suspect a disorder of one or more of the other ductless glands when the parathyroids show evidence of disturbed function.

(2) *Thyroid Gland*.—Some investigators maintain that the thyroid and parathyroid glands are reciprocal in action, others contending that they are functionally antagonistic. The available evidence does not warrant complete substantiation of either view. Those who support the theory that their function is reciprocal assert that the tetany that follows simultaneous extirpation of the thyroid and parathyroids is of a milder type than that which results from parathyroidectomy alone, maintaining that if the thyroid were not removed, the parathyroid defect would be more strongly manifested. Opposing argument is that removal of the thyroid lowers the metabolism and thus brings about a state of hypo-excitability of the tissues. Barker, having extensively reviewed the literature on this subject, believes that the idea of reciprocal supporting function is the more logical.

(3) *Pituitary Gland*.—The polyuria occasionally seen in tetany has been attributed to a disturbance of the pars intermedia of the hypophysis. The hypertrophy of the pars intermedia of the pituitary occurring after removal of the parathyroid glands speaks in favor of the co-operative function of these two organs, and is suggestive of partial compensation by the pituitary gland for the loss of parathyroid function.

(4) *Gonads*.—The changes in menstruation and lactation in tetany and the relation of pregnancy to tetany are well established. It is assumed that during pregnancy the demands upon the parathyroid glands are greater than can be met and that, as a result, symptoms suggestive of calcium deficiency ensue, such as softening of the teeth, and, at times, tetany.

(5) *Pancreas*.—Little substantiating evidence is found as to the association of the pancreas with the parathyroid glands.

(6) *Suprarenal Glands*.—Guleke has demonstrated that a disturbed function of the suprarenal glands frequently causes tetany spasms to disappear, probably indicative of an antagonism between the parathyroid and the suprarenal glands.

(7) *Thymus*.—Uhlenhuth has stated that possibly tetany is more common in children than in adults, due to the fact that the thymus is replaced by connective tissue in adult life. He suggests that the relation of the thymus to tetany may explain the occurrence of tetany in the pregnant woman, in that her own thymic function is supplemented by thymic products from the fetus.

Thus there is often demonstrable a concomitant disorder of other ductless glands when the parathyroid granules apparently are disturbed sufficiently to cause definite muscle excitability.

The 100 endocrine cases studied with reference to blood calcium content are listed in Table I, page 611.

Of these 100 endocrine cases, 38 were considered to have a disturbance in only one gland, and 62 a disorder of more than one gland. From the table it can be seen that, of these 100 cases, 19 (19 per cent.) had a calcium deficiency and 2 (2 per cent.), a calcemia. In the 6 cases of thymic enlargement the blood calcium was found to be normal. Of the 8 cases classified as pluriglandular disorder, 6 (75 per cent.) showed a deficiency in calcium. It might be stated here that none of these 6 cases manifested clinical evidence of calcium deficiency (Chvostek's sign, Trousseau's phenomenon, Hoffmann's sign, leg and arm phenomenon).

Arthritis.—Calcium deficiency as a cause in certain cases of chronic arthritis is much debated. Groves and Vines have associated arthritis with three conditions: (1) Changes in the joints; (2) changes in the parathyroid glands, and (3) changes in the intestinal mucosa. Collip has suggested the possibility of hypoparathyroidism in arthritis on the above-mentioned basis, as has Forbes, likewise. Horowitz has reported a high calcium content (16.8 mg.) in cases of acute gout, and has found that 5 out of 14 cases of arthritis deformans with marked deformity gave a

TABLE I

Gland chiefly involved.	No. of cases.	Blood calcium (100 c.c. serum).	No. of cases.	Per cent.
Thyroid:				
Hyperactivity.....	13	Normal 8.5 mg. 11.5 mg.	9 3 1	23.0 7.7
Hypoactivity:.....	43	Normal 8.5 mg. 7.5 mg.	37 5 1	13.9
Normal activity:				
Colloid goiter.....	1	8.5 mg.		
Cystadenoma.....	1	Normal		
Pituitary:				
Posterior lobe:				
Hypoactivity.....	2	Normal		
Hyperactivity (glycosuria).....	1	Normal		
Anterior lobe:				
Hypoactivity.....	2	Normal		
Hyperactivity.....	1	8.5 mg.		
Pituitary tumor.....	3	Normal 12.0 mg.	2 1*	33.3
Gonads:				
Hypoactivity.....	8	Normal		
Hyperactivity (pinealism, suprarenal cortex disorder).....	5	Normal 8.5 mg.	4 1	20.0
Suprarenal:				
Hypoadrenia.....	3	Normal 8.5 mg.	2 1	33.3
Thymus enlargement.....	6	Normal		
Diabetes mellitus.....	3	Normal 12.0 mg.	2 1	33.3
Pluriglandular (no predominating single glandular disturbance).....	8	Normal 8.5 mg. 7.5 mg.	2 5 1†	75.0

* Six months after operation by Dr. Harvey Cushing: 8.5 mg. One year after operation: 9.5 mg.

† Muscle twitching (habit).

higher calcium determination than normal. Coates and Raiment have reported a high calcium content in cases of gout.

In this series, 6 cases of arthritis were encountered, all of the chronic type. Of these, 4 showed a normal blood calcium, 1 (16.6 per cent.) a calcium slightly below the normal (8.5 mg.), and 1 an increased calcium (12 mg.).

Migraine and Epilepsy.—These two medical entities are classified in one group because of the recent attempts to fix them in the same etiologic family. Calcium deficiency and migraine have not been definitely correlated in the literature, but epilepsy is considered in some instances to bear a relation to tetany. Emil Redlich, of Vienna, in 1911 published a review of the literature to that time on such relationship, finding 72 cases which might be considered as positive examples. Sachs also supports the theory of a definite relation between tetany and epilepsy. In all cases of muscular twitching, suggestion has been made as to a possible calcium deficiency.

This series embraces 12 cases of migraine and 7 cases of epilepsy. Of the 12 migraine cases, 1 (8.3 per cent.) showed a calcium below the normal (8.7 mg.), and 1 a calcium above the normal (12.5 mg.). Of the 7 cases of epilepsy, 2 (28.6 per cent.) had a lowered calcium content (8.6 and 8.4 mg. respectively). The remaining 5 cases were within the normal.

Cardiovasculorenal Disease.—In this series there were 12 cases in which the heart alone was involved, 4 cases of nephritis, and 12 cases of cardiovasculorenal disease, totaling 28. In advanced sclerosis attempts have been made to show that these calcium plaques are formed at the expense of the blood calcium. Calcium is accepted as a valuable agent in the reduction of cardionephritic edema. There has always been some question as to whether this effect of calcium is due to an existing deficiency or is entirely a physiologic process. Blum and others have explained this action on the basis of retained sodium due to disturbance in the mineral ratio of the body. They believe that calcium provokes the loss of sodium, which carries with it water, and that the calcium is then eliminated by the bowels and the chlorid is retained, becomes attached to the sodium, and is excreted by the kidneys.

Of the 28 cases of cardiovasculorenal disease studied, cal-

cium deficiency existed in 4 (14.2 per cent.), the lowest being 8 mg. In 1 case (3.6 per cent.) there was an increased calcium (12 mg.).

Gastro-intestinal.—Experimentally, Compere and Luckhart have suggested that the changes in the permeability of the mucosa of the gut have an important relation to parathyroid deficiency. In many infants spasmophilia results from mere constipation, though this is not considered to be due to intestinal changes. The gastro-intestinal disturbances studied numbered 22, including all forms of disorder along the entire tract. A calcium deficiency was present in 4 cases (18 per cent.), the lowest determination being 8.5 mg.

Infections.—Calcium therapy has been frequently employed on general principles in cases of chronic and acute infection. It is considered valuable in the correction of these infections through the agency of building up the body resistance. This series comprises 20 cases of infection, as follows: Sinusitis, tonsillitis, and labyrinthitis, 11; oral sepsis, 5; pyelitis, 3; neuritis, from obscure foci, 1. Calcium deficiency was found in 2 (10 per cent.), the lower being 9.4 mg. An increased calcium was found in 3 (15 per cent.), the highest being 11.5 mg.

Rickets and Ununited Fractures.—Pediatrists have given the disease of rickets due attention, but owing to the very few cases in this series it is given this position in the list. De Buys and von Meysenbug have employed serum determinations in the recognition of rickets at its earliest stage and in differentiating active and quiescent rickets. Their serum determinations have coincided with the radiologic signs in this condition. Peterson found a deficiency in either calcium or phosphorus in 11 out of 17 cases of ununited fracture, and in all cases where non-union persisted in spite of repeated operation.

Only 2 cases of rickets were seen in this series, both of which were considered clinically active, both showing, however, a blood calcium content well within the normal.

Malignancy comprises 4 cases of this series, 3 (75 per cent.) of which had a blood calcium below the normal. Probably the reason for this high percentage is that 2 of these 3 cases in which

calcium deficiency was found exhibited involvement of the bony structures.

Miscellaneous.—The remainder of the series consists of practically all clinical entities. Of 56 miscellaneous cases, only 5 (8.9 per cent.) showed a calcium deficiency, as follows: Torticollis (8.4 mg.); pregnancy, of three months' duration (8.6 mg.); manic depressive psychosis (7.3 mg.); chlorosis (8.3 mg.); psychoneurosis (8.5 mg.).

No cases of hemophilia or purpura were seen in this series.

Summary.—A summary of cases is shown in Table II. In the small series of 4 cases classified as malignancy, there is a low blood calcium in 3 (75 per cent.). In 2 of these a definite decalcification of the bony tissues was present. This in itself would be a cause for calcium deficit and would not permit conclusions regarding calcium deficiency in malignancy. Eliminating this high percentage, it may be noted that the next highest is that of disease of the respiratory tract, the cases showing a deficiency equaling 21.7 per cent. of the total number.

TABLE II

Groups.	No. of cases.	Blood calcium.					
		Normal.	Per cent.	Below normal.	Per cent.	Above normal.	Per cent.
Tetany	3	3	100.0				
Respiratory diseases	23	18	78.3	5	21.7		
Hypersensitiveness	7	6	85.8	1	14.2		
Endocrine disorders*	100	79	79.0	19	19.0	2	2.0
Arthritis	6	4	66.8	1	16.6	1	16.6
Migraine and epilepsy	19	15	79.0	3	15.8	1	5.2
Cardiovasculorenal disease	28	23	82.0	4	14.2	1	3.8
Gastro-intestinal disorders	22	18	82.0	4	18.0		
Infections	20	15	75.0	2	10.0	3	15.0
Rickets	2	2	100.0				
Malignancies	4	1	25.0	3†	75.0		
Miscellaneous	56	51	91.1	5	8.9		
Total	290	235	81.0	47	16.2	8	2.8

* Blood calcium determination normal in all cases of enlarged thymus.

† 1. Beginning myeloma of skull.

2. Sarcoma of pelvis.

3. Recurrent metastatic carcinoma of peritoneum.

Incidence of Positive Chvostek's Sign as Compared with the Calcium Content.—Chvostek in 1878 described his well-known sign, showing that there existed a hyperexcitability of the motor nerves of the face in tetany. He pointed out that by tapping the nerves of the face, a response of the facial muscles occurred. According to the degree of hyperexcitability existing, three grades of the facial phenomenon are distinguishable. In the highest grade, Chvostek I, a tap in the region just anterior to the ear causes the muscles of the entire side of the face, forehead, eyelid, cheek, nose, and lips suddenly to contract. In Chvostek II the nose and angle of the mouth draw up following a tapping below the zygoma. In Chvostek III a slight twitching of the angle of the mouth occurs when the cheek is tapped. This facial phenomenon is significant diagnostically in tetany. Occasionally it may be absent in tetany, and in many cases it is present where no evidence of tetany, latent or manifest, is demonstrable. It has been stated that this sign is positive in children more often than in adults.

In 258 of the 290 cases of this series, Chvostek's sign was recorded either negative or positive. Of these 258 cases, 55 gave a positive Chvostek's sign. These were not recorded as to degree of reaction. Of the 55 cases in which Chvostek's sign was positive, 7 showed a calcium below the normal, the lowest being 8 mg. There was no evidence otherwise of spasmophilia or active tetany, and in only 1 of these 55 cases was there a history of tetany. From this it is seen that a positive Chvostek's sign was present in 21.3 per cent. of the 258 cases examined, 7 (12.7 per cent.) of which showed a lowered calcium, and in only 1 (1.8 per cent.) of which was there a history of tetany. Classifying into decades the cases in which a positive Chvostek's sign was present, no significance as to age incidence was established.

Treatment.—Hjort and Eder have reported a case of strumiprивous tetany treated with parathyroid extract alone which did not recover. They found that this glandular substance caused a rise in the serum calcium only when supplemented by thyroid therapy orally. The treatment consists essentially in the removal of the cause as far as possible. If there are any

associated influencing factors, such as hypothyroidism or other glandular disturbance, these should be treated conjointly. A diet low in proteids, though well balanced otherwise, should be encouraged. The intravenous injection daily of 10 per cent. calcium chlorid has been more efficacious than parathyroid extract in cases treated at this clinic. However, parathyroid extract should be given in addition to calcium salts, for any effect it might have in causing a rise in the blood calcium. Surgical transplantation of the parathyroid glands in some cases may have to be resorted to. Symptomatic treatment, such as diuretics, purgatives, sedatives, rest, sunshine, fresh air, etc., should be included.

Conclusions.—From the foregoing the following conclusions are presented: (1) With our present methods of blood calcium estimation, no obscure calcium deficiency was found to exist in the various systemic diseases in a percentage of cases sufficiently high to consider it a positive etiologic factor. (2) Where calcium deficiency cannot be demonstrated clinically, it is unlikely to be found to exist in the blood. The most valuable diagnostic aids in determining calcium deficiency are the clinical means, namely: (a) Chvostek I (Chvostek II and III are suggestive, though not so convincing); (b) Trousseau's phenomenon; (c) Hoffmann's phenomenon; (d) Erb's sign, and (e) the leg and arm phenomenon. When any of these are present, the blood calcium determination should be employed as an adjunct, at which time it is diagnostically valuable. (3) With the absence of clinical evidence, only repeated low calcium content determinations by accurate laboratory technic can be considered indicative of a disturbed calcium balance. (4) As far as these investigations show, there is no indication for calcium therapy in tuberculosis, asthma, chronic arthritides, hypersensitiveness, epilepsy, cardiovascularrenal disease, or infections. Calcium unquestionably should be administered in tetany, rickets, and certain diseases of the bone.

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